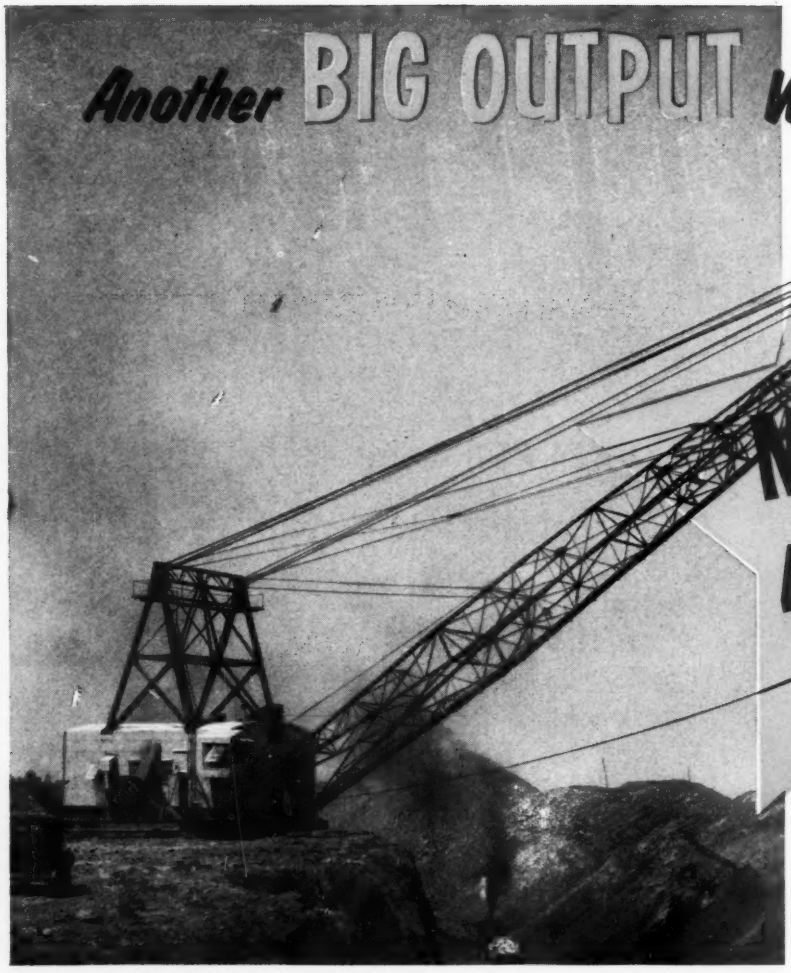
Mining

CONGRESS JOURNAL

DECEMBER 1954

Another BIG OUTPUT Walking Dragline



MODEL 400-W

7-to 9-cu. yd. capacity

Here's big news for men engaged in strip mining or heavy-duty construction work — Bucyrus-Erie has added another big-yardage, all-weather dragline to its world-famed "walker" line. You'll find unequalled money-making features in the new 400-W . . . here are some of them.

THREE POWER COMBINATIONS — Your choice of heavy-duty diesel engine, electric power with independent motor-driven drums, and electric power with clutch-operated drums.

EFFICIENT FRONT END — All-welded boom has T-section chord members with tubular bracing for maximum strength, minimum deadweight. Fast filling, clean carrying, quick dumping buckets help assure big output.

LONG WORKING RANGE — Without throwing bucket, material can be moved 405 feet with the 400-W's 200-ft. boom and 7-yd. bucket, 377 feet with the 185-ft. boom and 8-yd. bucket, and 351 feet with the 170-ft. boom and 9-yd. bucket. Digging depths range up to 135 feet.

RAPID OPERATING CYCLE — Fast hoisting and lowering with powerful air-controlled clutches and brakes . . . rapid acceleration and deceleration of the swing under variable-voltage Ward Leonard control.

EXCEPTIONAL MANEUVERING ABILITY — With exclusive Bucyrus-Erie walking mechanism, the 400-W walks where you want it, when you want it, in good weather or bad, even on ground that's too soft for other machines.

STRONG RIGID BASE — Provides 748 sq. ft. of bearing area for full stability in working and walking.

STURDY MAIN MACHINERY — Is simple in design . . . is arranged for accessibility in servicing and maintenance, and for maximum counterbalancing effect . . . is rigidly held in accurate alignment on deep-section revolving frame.

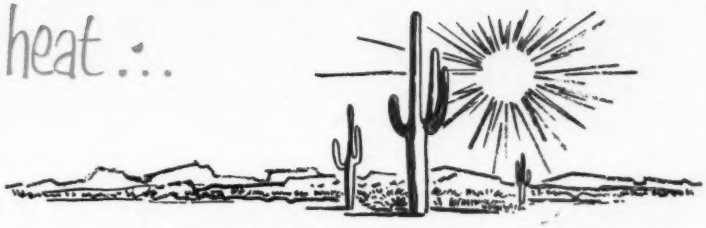
Complete information is yours for the asking — write today!

25L54C

BUCYRUS ERIE

South Milwaukee, Wisconsin

Expose it to sun and heat...

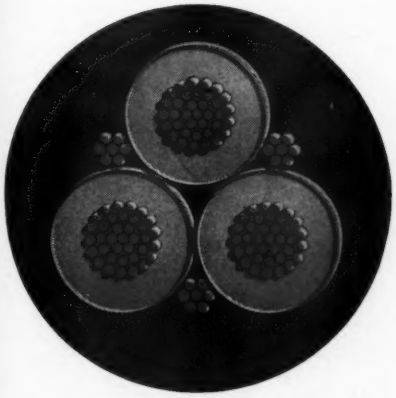


Pull it over rocks and shale...

Trench it in presence of acid water...

Through it all—

Anaconda's tough **MINE POWER CABLE** keeps power flowing



This easy-to-splice cable is built for heavy duty. It saves you money. It handles well. And it lasts longer – with fewer power interruptions, less maintenance trouble.

Here's why:

BUTYL INSULATION has high dielectric strength . . . superior long-aging characteristics . . . and excellent resistance to moisture, ozone, and heat.

NEOPRENE JACKET is tough . . . has real flexibility and great strength . . . and is resistant to flame and corrosive mine water.

See your nearest Anaconda Sales Office or Distributor for full information about this durable, low-cost Mine Power Cable. Do it today! *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

54340

the right cable for the job

ANACONDA® WIRE AND CABLE

Jeffrey 56-FH Drill mounted on High 70-UR. Drill is folded back as 70-UR positions for top cut.

725-53

Bugduster installed on Standard 70-UR. Note ample space between traction chain and tire — real protection for tire sidewalls if tire should go low and flatten toward chain.

558-54

A Standard 70-UR, below, makes a horizontal cut in a 6′ coal seam.

1103-53

Jeffrey 70-UR Universal Coal Cutter is available in four models, differentiated by tramming height and cutting range. Tramming heights are: Low, 30″; Standard, 34½″; High, 37¾″; and Extra High, 45″. Cutting range of Standard model is 11″ below floor to 7′9″ above, with the maximum height increased to 13′ on the Extra High model. All models can be duplicated in A.C. with slight differences in tramming height.

Among accessory equipment offered is the hydraulically driven Bugduster for taking cuttings away from the cutter chain automatically. A 56-FH face drill can be mounted on top of the 70-UR, making a two-in-one combination.

the Champ! JEFFREY 70-UR

CUTS COAL AND CUTS COSTS

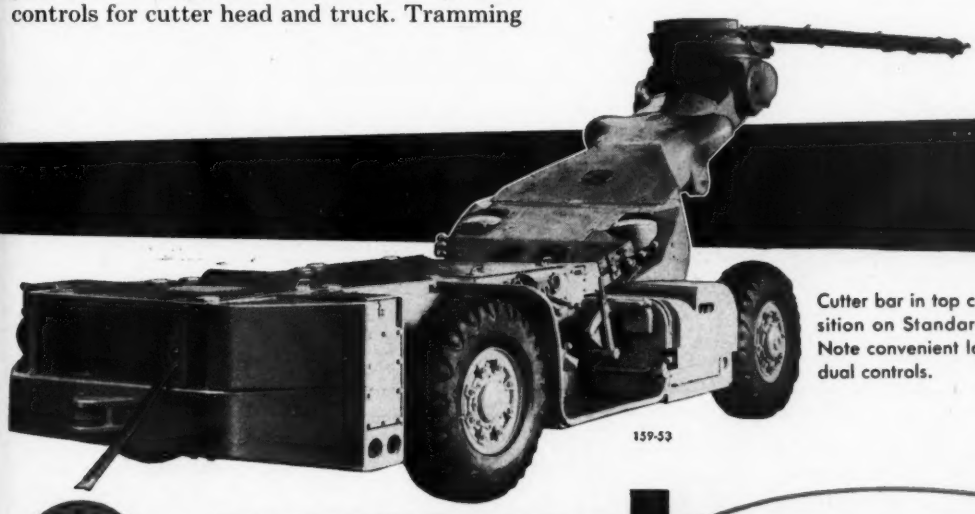
Mine superintendents call it "The Champ" . . . it's the Jeffrey 70-UR Universal Coal Cutter, engineered and built to produce more tonnage with less maintenance.

70-UR's rugged versatility pays off at the working face. Head and cutter bar can be rotated 360° in either direction, positioned to make any kind of cut any place in the seam. From one position it makes a 30′ horizontal cut (with a 9′ cutter bar) or a shearing cut 5′5″ to either side of centerline of machine.

Operators report smooth and positive traction for sumping even when cutting at extreme range. The 70-UR's wide wheel gauge, long wheel base, low center of gravity and large pneumatic tires give sure-footed stability. Dual controls for cutter head and truck. Tramming controls centrally located in operator's pit allow operator to face direction of travel. All operations hydraulically actuated (except cutter chain) for quick, positive, accurate response.

Maintenance men back this heavyweight champion . . . it has staying power that reduces down-time, cuts maintenance costs. Cutter chain and cutter chain drive are built for rugged duty. Cutter bar folds to protected position over top of machine for tramming. Shortens over-all tramming length to 21′3″.

Put punch in your mining cycle! Get full information on the 70-UR Universal Coal Cutter. Contact your nearest Jeffrey salesman or write to Jeffrey Mining Sales Division, today.



159-53

Cutter bar in top cutting position on Standard 70-UR. Note convenient location of dual controls.

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA.

IF IT'S MINED, PROCESSED OR MOVED

. . .IT'S A JOB FOR JEFFREY!

Cuts and loads 7 tons of coal per minute, with TIMKEN® bearings taking tremendous thrust loads

ITS cutting arms rotating at 14 rpm, the rugged Goodman 500 Miner slugs 13′2″-wide paths through solid, unprepared seams, cuts and loads up to 7 tons of coal per minute.

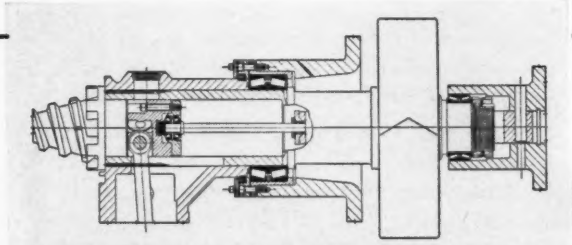
The main work of cutting is done by a pair of auger-like pilot cones and six long cutting arms that hold the bits. Taking the tremendous thrust loads on their shafts are Timken® tapered roller bearings.

Heavy shock loads set up by high speed cutting are handled easily by Timken bearings. Rollers and races are case-hardened to give them tough, shock-resistant cores and hard, wear-resistant surfaces. And line contact between rollers and races gives Timken bearings extra load-carrying capacity.

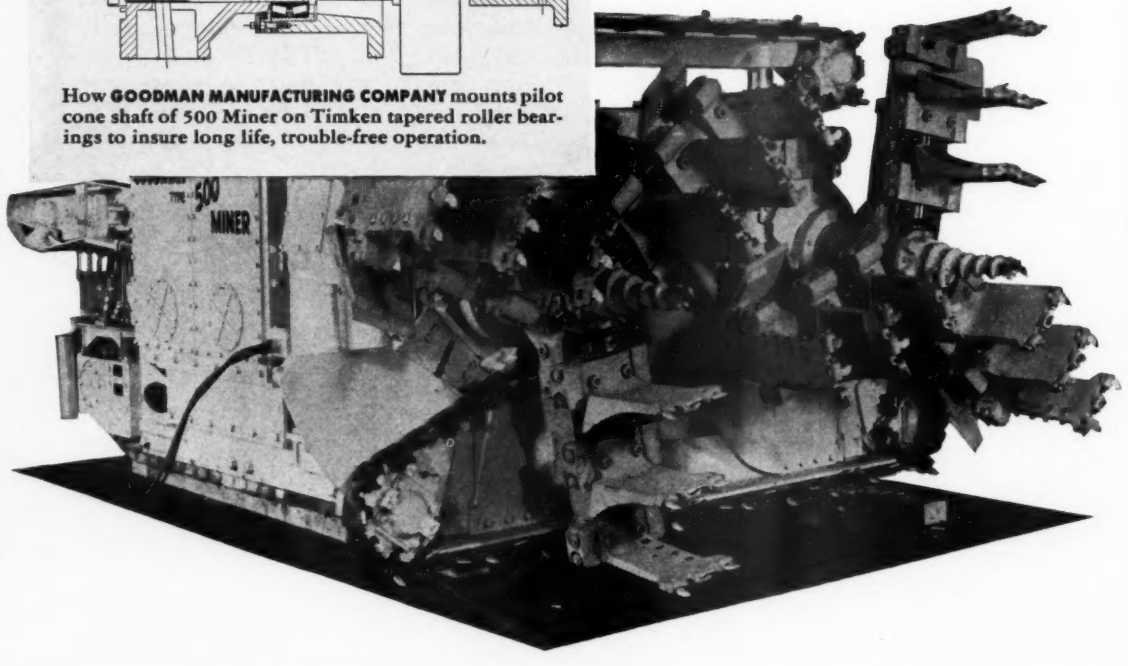
Particularly important for mining machines, working under a constant stream of coal, are effective closures. Timken bearings help make closures more effective by holding housings and shafts concentric. Lubricant stays in, dirt and coal dust out.

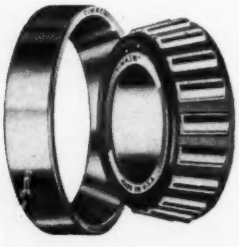
In no other bearing can you get the combination of advantages which Timken bearings give you. Specify Timken bearings in the equipment you build or buy. Look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **GOODMAN MANUFACTURING COMPANY** mounts pilot cone shaft of 500 Miner on Timken tapered roller bearings to insure long life, trouble-free operation.

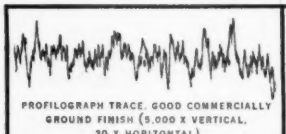




TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



PROFILOGRAPH TRACE, GOOD COMMERCIALLY GROUND FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)

PROFILOGRAPH TRACE, TIMKEN BEARING FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)

OPTICAL FLAT, PERFECT FINISH

SMOOTH TO MILLIONTHS OF AN INCH

Surface finish of high quality Timken bearing rollers and races is so smooth that it takes a profilograph to measure its smoothness. This instrument measures surface variations to a millionth of an inch, as shown at the left.

NOT JUST A BALL **NOT JUST A ROLLER** **THE TIMKEN TAPERED ROLLER** **BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION**

DECEMBER, 1954

VOLUME 40 • NUMBER 12

Mining

CONGRESS JOURNAL

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Circulation
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Published Monthly. Yearly subscriptions, United States, Canada, Central and South America, $3.00. Foreign $5.00. Single copies, $0.30. February Annual Review Issue, $1.25. Entered as Second-class Matter, January 30, 1915, at the Post Office at Washington, D. C.

Indexed regularly by Engineering Index, Inc

FRONT COVER: An efficient steam locomotive hauls a load of coal through wintery West Virginia hills. (Photo courtesy Association of American Railroads.)

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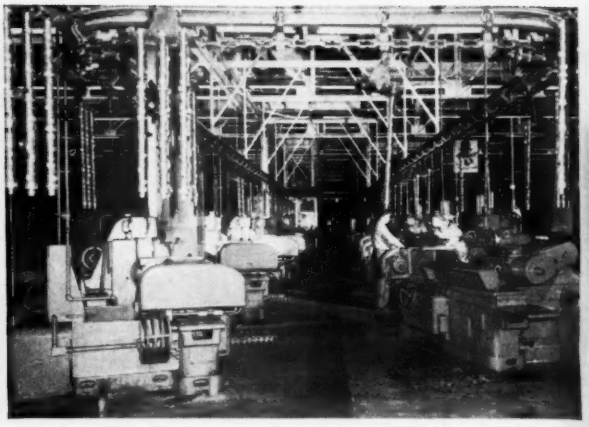
BUILT AND APPLIED BY RELIANCE

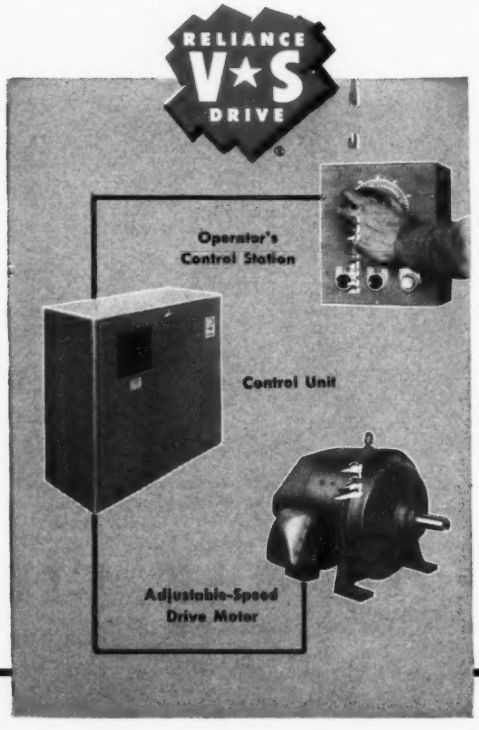
THE Tools of Automation

INCREASE PROFITS IN EVERY INDUSTRY

Coal, potash, bauxite, borax, etc., have been mined by the batch process since the beginning of mining. This continuous mining machine driven by special Reliance d-c. motors brings automation to mining.



In a camshaft production line, Reliance V★S Drive system provides stepless, easily adjustable speeds for fast, precision machining. Optimum cutting speeds extend tool life, reduce downtime.



Greater machinery output . . . improved production efficiency . . . both result in increased profits. And both result from using the Tools of Automation: Reliance electric motors, adjustable-speed drives, electronic controls, and applied engineering. They're setting new standards for low cost production in *every* industry.

These Tools of Automation can most efficiently lower your costs, because they're designed and applied to *your* specific situation. Reliance Application Engineers are backed by nearly 50 years' experience in perfecting the drive systems that can help you attain the degree of automatic production you require. For further information, write for the new booklet, "The Tools of Automation".

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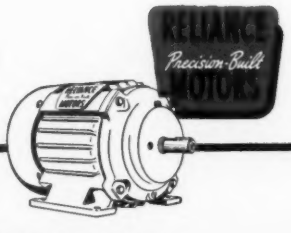
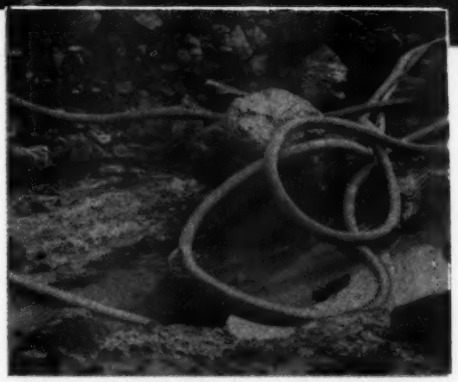


RELIANCE ELECTRIC AND ENGINEERING CO.

Sales Representatives in Principal Cities • 1116 Ivanhoe Road, Cleveland 10, Ohio



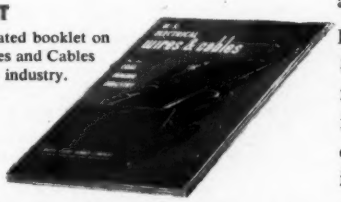
Note excellent flexibility of U.S. Royal Shielded Cables.

There's plenty of "drag miles" in U. S. ROYAL SHIELDED TRAILING CABLES

The constant dragging, flexing, twisting and bruising encountered in heavy service do not bother U.S. Royal Shielded Cables. The rugged jacket contains 60% by weight of neoprene; this jacket is cured in lead—all for more durability, more "drag miles". Consider also more than just the initial cost! Achieve a new low in your cable replacement costs—a new high in performance by specifying U. S. Royal Shielded Trailing Cable, the cable that can take a beating and come back for more.

FREE BOOKLET

Send for free illustrated booklet on U. S. Electrical Wires and Cables for the coal mining industry.



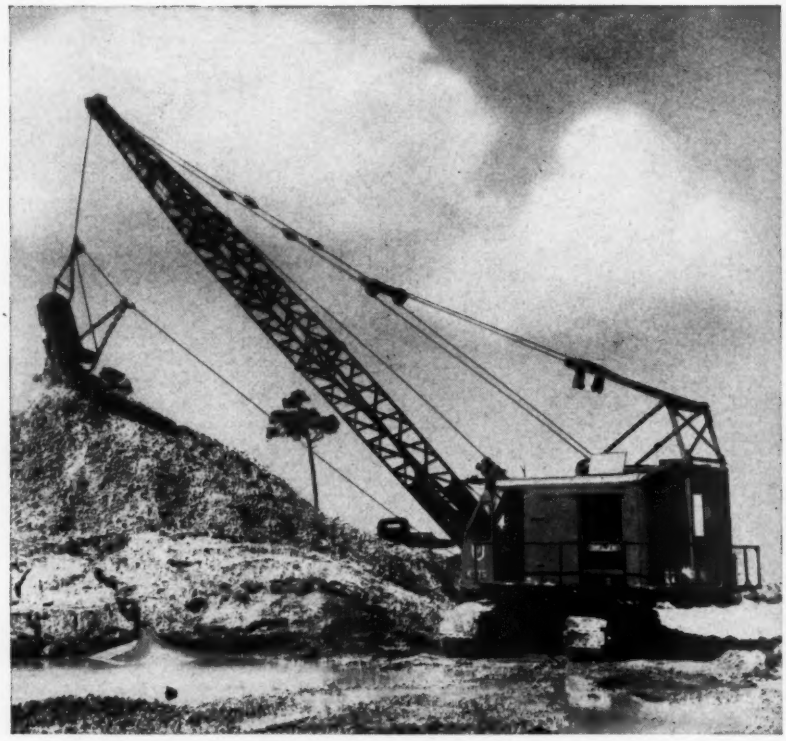
Here's the key to U. S. Royal's great performance; United States Rubber Company is the only electrical wire and cable manufacturer to grow its own natural rubber, manufacture its own synthetic rubber and its own plastics. This means *control of production* every step of the way—resulting in a better and more efficient product.

US RUBBER

UNITED STATES RUBBER COMPANY

Electrical Wire and Cable Department • Rockefeller Center, New York 20, N. Y.

MORE CYCLES PER DAY



AS A 1¾-YARD DRAGLINE. This fast swinging K-375 rig digs coral rock and sand in Florida. Speed-o-Matic control makes dig-swing-dump one fluid motion because operator has perfect "feel" of the load. There are no grabby clutches that produce lag and lost motion.

AS DEEP-DIGGING TRENCH HOE. This K-360 with 1¾-yard hoe makes full use of its 142 net hp, a natural for those deep, tough sewer jobs.

AS A HEAVY-DUTY 1¾-YARD SHOVEL. High strength components—precision machined—assure profitable, trouble free performance.

K-300 series shovel-cranes with *Speed-o-Matic* control, 142 net hp, plus greater "live weight" can boost your output up to 25%

IT'S not only how much per bucket—but *how many* buckets per day that piles up profits for shovel-crane owners. Smooth, instantaneous response of Speed-o-Matic power hydraulic control means faster, more productive cycles. Gives operator positive control for pinpoint accuracy and maximum safety. Cuts end-of-day fatigue too!

The 142 usable net hp gives you more digging or lifting power. And it has the built-in stamina and "live weight" necessary to produce under continuous use of this extra horsepower.

Equally important, with full convertibility you have maximum use of your K-300 rigs for hundreds of 1¾-yard jobs. Ask your distributor, or write for K-300 series literature now.

13.826-A

LINK-BELT SPEEDER CORPORATION
Cedar Rapids, Iowa

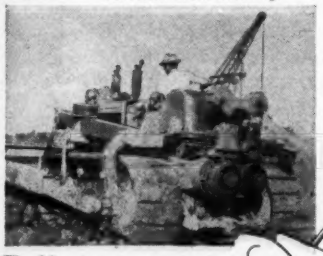
BUILDERS OF A COMPLETE LINE OF CRAWLER, TRUCK AND WHEEL-MOUNTED SHOVEL-CRANES

LINK-BELT SPEEDER

Walking Drags Go For Longer Walks Without Replacing...

Tuffy® DRAGLINES

Tuffy Scraper Rope
Flexible enough to withstand sharp bends . . . stiff enough to resist looping and kinking when slack . . . tough enough to resist drum crushing!



Tuffy Dozer Rope
Designed to take the punishment of small winch drums and small sheaves . . . the shock of blade manipulation under toughest going!

The dragline is a relatively small part of the huge investment in a walking drag. But too frequent dragline replacement can mount up to a sizeable part of maintenance.

In three important ways, Tuffy Draglines are constructed to run longer—handle more yardage before replacement is necessary.

1st To resist abrasion, the wires of tough steel in the outer lays of Tuffy Draglines are larger. They present a much larger wearing surface. It takes longer to wear them down.

2nd The inner structure of Tuffy Draglines is engineered to fully support the big wearing surface and add greatly to the overall strength of the rope as a whole—no loafing or weak parts.

3rd Tuffy Draglines are so engineered as to develop the maximum flexibility needed for accurate casting. This lets the operator come up with more bonus loads—fewer recasts.

Tuffy Slings
9-part, machine braided wire fabric construction is extra flexible, extra strong. Kinks or knots easily straightened out without material damage.

Tuffy Slusher Rope
A triangular 3 strand non-collapsing construction that doesn't drum crush, resists abrasion longer and has great line pull strength.

Ordering dragline from any Union Wire Rope distributor is a simple matter. The name Tuffy Dragline eliminates all complicated specifications. Along with the diameter and length, the words Tuffy Dragline will bring you a longer life rope for any drag bucket machine.

union Wire Rope corporation

2144 Manchester Avenue Kansas City 26, Mo.

Specialists In High Carbon Wire, Wire Rope and Braided Wire Fabric

Increase your footage p

Use CLEVELAND Air Legs and Drills...the easiest way to d

THE FEED YOU NEED — FROM ZERO FEED TO FULL LINE

Eleven detent positions enable drill operator to set and maintain pressures in a range from zero to full-line feeding pressure — with an increase of 9 psi at each setting. That's why a CLEVELAND Air Leg and H10AL Drill combination gives top performance in any kind of rock.

Shown here is a **CLEVELAND AL-92** Telescopic Air Leg with H10AL Drill. Because of space limitations, full length isn't shown.

CLEVELAND AL-92 Telescopic Air Leg with H10AL Drill and exclusive 11-position feed control

SPECIFICATIONS

Standard, automatic controlled wet-type backhead.

Chuck Sizes	7/8" x 4 1/4" — or other popular steel shank sizes	
Weight, Drill	60 lbs.	
Air Hose	3/4"	
Water Hose	1/2"	
Full Feed Travel	4'	6'
Collapsed Feed	2' ea. piston	3' ea. piston
Closed Length	48"	60"
Extended Length	96"	132"
Air Leg Weight	37 lbs.	42 lbs.

CLEVELAND AL-90 Single Extension Air Leg for use with H10AL Drill and exclusive 11-position feed control

SPECIFICATIONS

Weight, Drill	60 lbs.
Air Hose	3/4"
Water Hose	1/2"
Feed Travel	36" — 48" — 60"
Closed Length	56 3/4" — 69" — 81 1/4"
Extended Length	92 3/4" — 117" — 141 1/4"
Air Leg Weight	30 lbs. — 34 lbs. — 37 lbs.

CLEVELAND AL-91 Single-Extension Air Leg for use with any 35-lb., 45-lb., or 55-lb. class rock drill. Feed control built into air leg.

SPECIFICATIONS

Standard wet, or automatic controlled, wet-type backhead available.

Air Hose	3/4"
Water Hose	1/2"
Feed Travel	36" — 48" — 60"
Closed Length	58" — 71" — 83"
Extended Length	94" — 119" — 143"
Air Leg Weight	35 lbs. — 38 lbs. — 41 lbs.

per man-shift!

to drill rock

Choose the drilling combination that's best for you from the industry's only complete line of telescopic or single-extension air legs.

MINERS like to use a CLEVELAND Air Leg and H10AL Drill combination. It gives them real flexibility — they can use it as a drifter . . . as a stoper . . . or as a hand-held drill . . . set-ups are quick and easy.

It's an easy-handling combination, also. The air leg supports the drill and absorbs fatiguing recoil. You get flexible feeding pressure, too — from zero to full line. That's why miners drill more footage with CLEVELAND, yet are less tired at the end of their shift.

Exclusive CLEVELAND built-in feed control in the H10AL Drill eliminates a third hose and cumbersome "Y" connections. There's no feed-control bleed valve — the operator doesn't have to bleed off air continuously, to maintain suitable feeding pressure. He can change or advance the position of the leg easily and quickly.

The air leg holds the drill in line with the hole — thus reducing front-end drill wear and practically eliminating rotation strains.

These are ways a CLEVELAND Air Leg and H10AL Drill combination helps you get more drilling for less cost. Take advantage of them.

Write today for Bulletin RD-30 for complete information.

CLEVELAND AL-93 Telescopic Air Leg for use with any 35-lb., 45-lb., or 55-lb. class rock drill. Feed control built into air leg.

SPECIFICATIONS

Full Feed Travel	4'	6'
Collapsed Feed	2' ea. piston	3' ea. piston
Closed Length	50"	62"
Extended Length	98"	134"
Air Leg Weight	42 lbs.	47 lbs.

CLEVELAND ROCK DRILL DIVISION

Westinghouse Air Brake Co.

12500 BEREA ROAD • CLEVELAND 11, OHIO

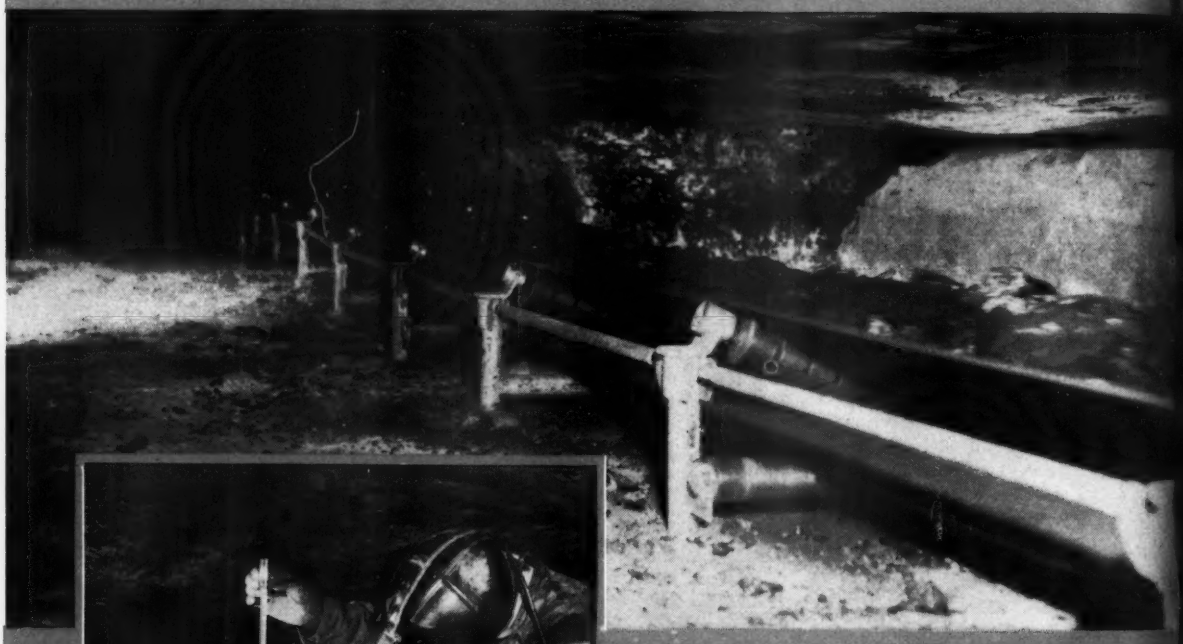
RD-59

No other BELT IDLER

the JOY LIMBEROLLER

(PAT. APPLIED FOR)

has everything you want for coal haulage



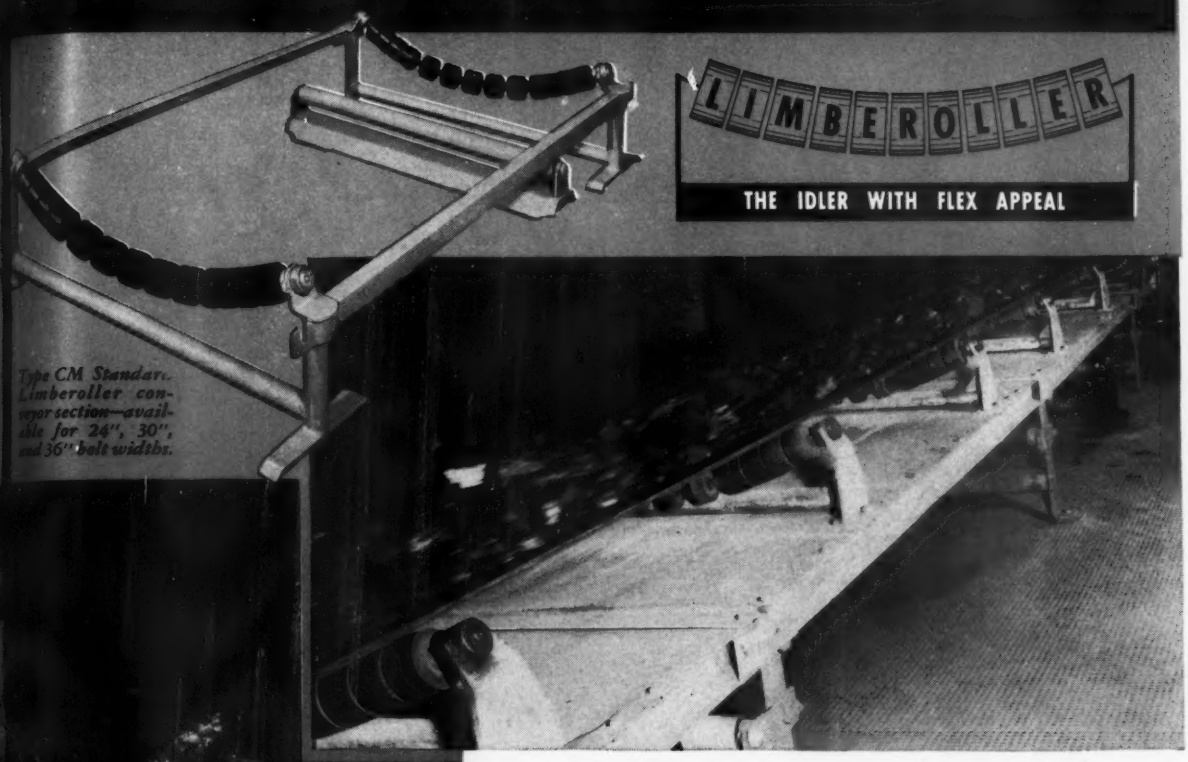
UNDERGROUND . . . *the Joy Limberoller weighs 2/3 less than a steel idler. Neither the CM (standard) or CL (low) stands require bolts or cover sheets; there are fewer parts and less weight to handle than with any other conveyor.*

IN LOW COAL . . . *with the CL stand (left) the Limberoller provides a lower conveyor system than any other available. Now you can have the efficiency of belt haulage in tight locations where it was never before possible.*

even comes close!

LIMBEROLLER

THE IDLER WITH FLEX APPEAL



Type CM Standard Limberoller conveyor section—available for 24", 30", and 36" belt widths.

The Limberoller consists of a series of pressure-molded neoprene discs, molded to a neoprene-sheathed, flexible steel cable. The cable is freely suspended from two cadmium-plated, precision-type, double-row ball bearings. Bearings are supported above and to each side of the belt, out of the dirt zone. They simply drop in place and are locked with spring clips—can be changed or new stands added while belt is loaded and moving.

ABOVE GROUND . . . *Limberoller idlers can be used anywhere around the mine. Above, in use in the tipple, mounted on type HM stands which have brackets for bolting to conventional conveyor sections.*

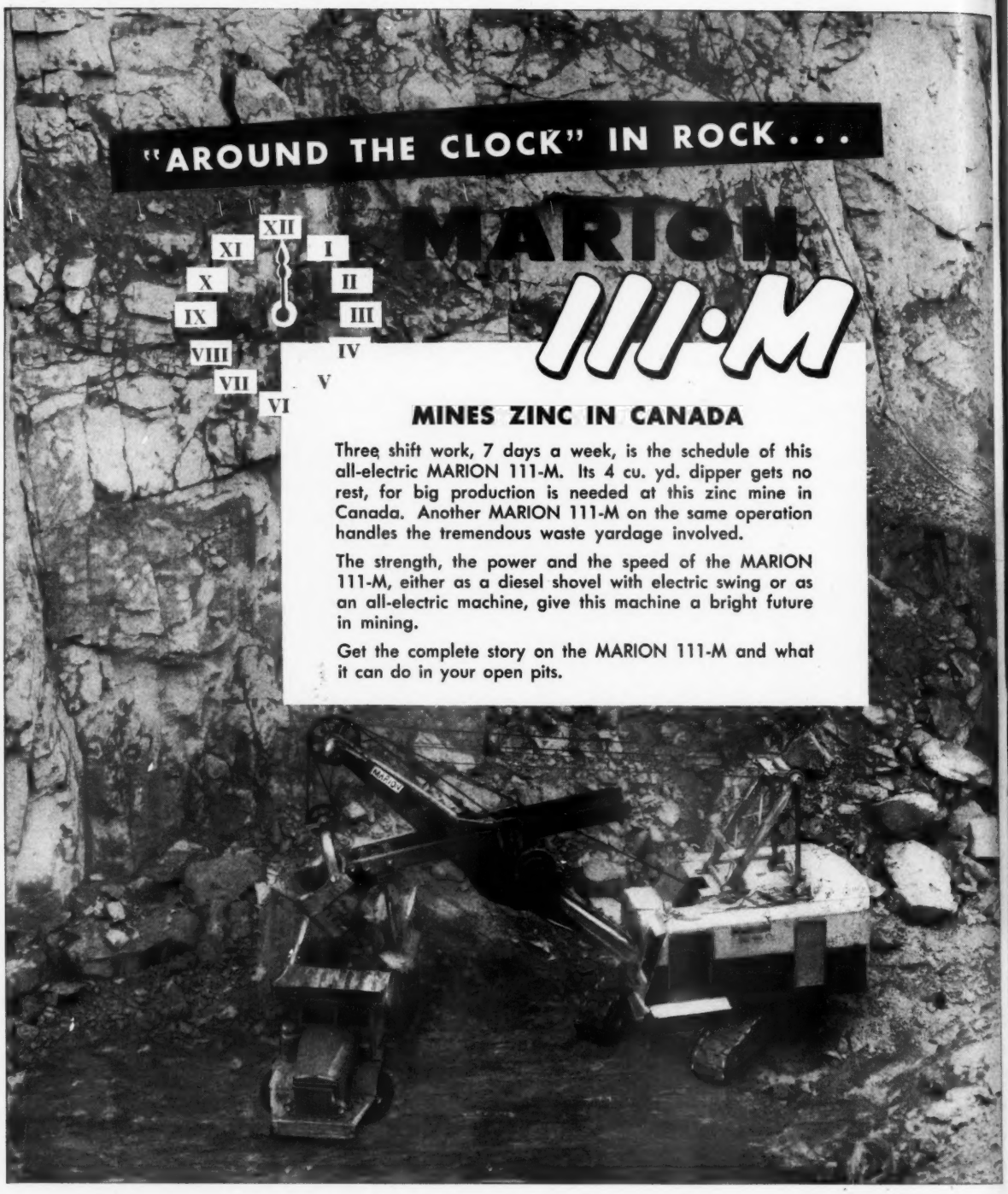
With the unique Limberoller Idler, Joy again leads in pointing the way to reducing your costs and protecting your profit margin. Here is a field-proved and foolproof belt idler that is self-conforming and self-cleaning—resists corrosion, abrasion and flame—reduces belt wear and prolongs its life. The simple, rugged design of a Limberoller conveyor system makes it easier, faster and less costly to install and maintain—to set up, knock down and move—than any other conveyor available. ● Let us figure on *your* needs! ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario*

Write for Bulletin LD-103, or

Consult a Joy Engineer

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT


"AROUND THE CLOCK" IN ROCK . . .
MARION
111-M
XII
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
MINES ZINC IN CANADA
Three shift work, 7 days a week, is the schedule of this all-electric MARION 111-M. Its 4 cu. yd. dipper gets no rest, for big production is needed at this zinc mine in Canada. Another MARION 111-M on the same operation handles the tremendous waste yardage involved.
The strength, the power and the speed of the MARION 111-M, either as a diesel shovel with electric swing or as an all-electric machine, give this machine a bright future in mining.
Get the complete story on the MARION 111-M and what it can do in your open pits.

MARION • OSGOOD • GENERAL O-G

MARION POWER SHOVEL CO. • MARION, OHIO, U. S. A.

A Subsidiary of Merritt-Chapman & Scott Corporation

POWER SHOVELS FROM ¼ TO 60 CUBIC YARDS
PILE DRIVERS • WALKING DRAGLINES

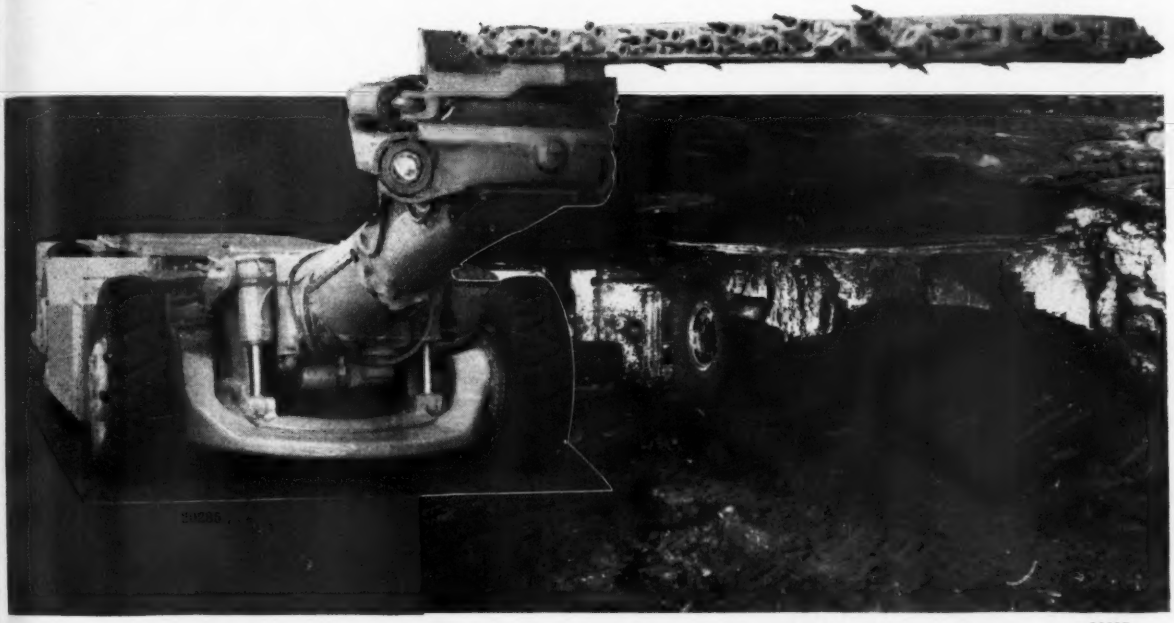
DRAGLINES • CLAMSHELLS • CRANES • BACKHOES
TRUCK CRANES • MOBILCRANES • LOG LOADERS

Your Confidence Is Justified Where This Flag Flies

It moves anywhere in the mine . . .
It cuts anywhere in the seam

the *Goodman*
ALL-PURPOSE COAL CUTTER

- **Top cuts**
- **Center cuts**
- **Bottom cuts**
- **Shears**



20635

The type "2400" bottom cutting a room neck. Bugduster automatically handles cuttings.

The Goodman Universal Cutter is built for varied application, productive performance and hard service at reasonable upkeep cost. It's the ideal working mate for Goodman Loaders and Shuttle Cars.

Available in two heights:
Low —Type 2400, 30" to 34"
High—Type 2410, 40½" to 44"

The Goodman rubber-tired universal cutter is fully described in Catalog No. 531. Let us send you a copy now.

Goodman
MANUFACTURING COMPANY
4834 S. Halsted Street • Chicago 9, Illinois

Cutting Machines · Conveyors · Loaders · Shuttle Cars · Locomotives · Continuous Miners

How long will your trackwork carry its share of the load?

With mining costs climbing faster than the selling price of coal, it becomes more important than ever to improve production methods and equipment. This in turn throws the spotlight on the need for new and better haulage systems. Track laid with 60-lb rail, or even heavier, to carry larger-capacity cars. Improved layout design to speed movements and cut maintenance to the bone.

The cost can be surprisingly low. Far lower, in fact, than the cost of *not* modernizing. You'll find it especially economical if you turn your haulage problems over to Bethlehem engineers. They have the experience and the facilities behind them to design or revamp your system precisely to your needs, with minimum waste and time loss.

Here is how they would go about it. First, a study of your workings. Next, a plan designed for your individual operation. Then, after approval of details, the cutting, curving and fabrication of the track itself. Your Bethlehem layout would be accurately prefitted at our plant, then shipped to location complete to the last spike and joint bar.

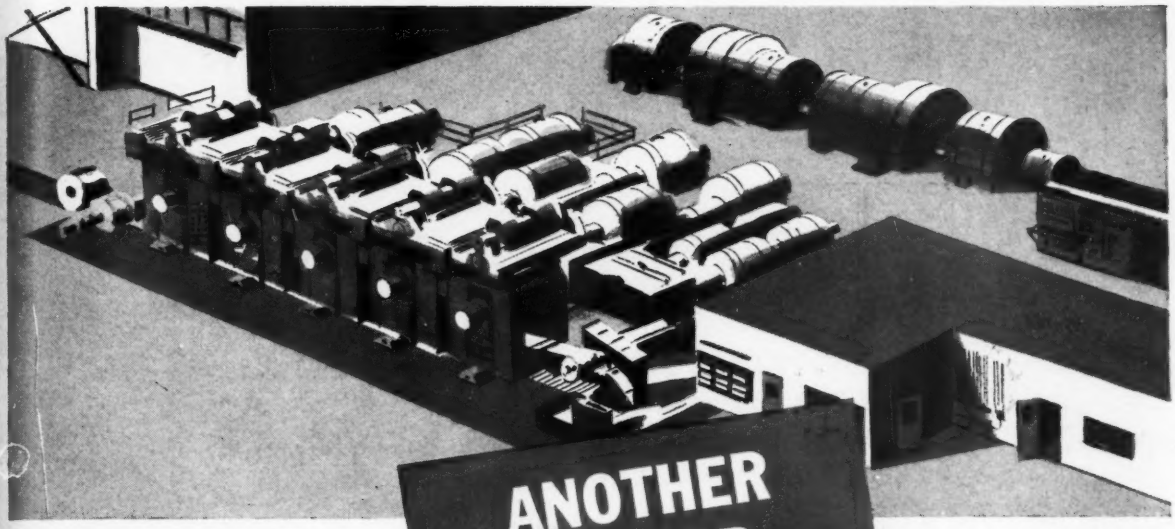
Once installed, such a Bethlehem system would measure up to your requirements for many years to come. With its contribution toward lower mining costs, it would pay for itself surprisingly soon. A Bethlehem engineer is available through the office nearest you. Call him; he will be glad to give you the story in full detail.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM PREFABRICATED TRACK



ANOTHER BIG JOB DONE BETTER

WITH NATIONAL BRUSHES
TRADE-MARK

NATIONAL CARBON has, for years, analyzed and supplied the proper brushes for large, steel-mill-production equipment.

TYPICAL EXAMPLE is a five-stand tandem cold mill of the type shown, covering just about the widest range of motor types and brush requirements found in any integrated unit. Calling upon its long experience and diversified product line, National Carbon recommended a specific brush grade for every electrical component in the mill, from pump motors to main drives.

RESULTS were outstandingly successful. Production was established at a high level of availability and has continued at the same rate.

NATIONAL CARBON COMPANY works closely with equipment manufacturers, power companies and principal users of industrial power. Customers know that for *all* motor and generator problems, no other brush supplier can match National Carbon's combination of experience, product-diversification and service-facilities.

Let "National" brushes show you how good really good brush performance can be!

ELECTRICAL AND MAINTENANCE SUPERINTENDENTS!
Give Your Men This FREE Maintenance Course

Mail coupon and receive as many copies as you need — without obligation. Short, entertaining, instructive installments. Profusely illustrated. Quick reference for many day-to-day maintenance problems. Useful for trainees. First mailing includes all back issues.

GET IT NOW!

Send me_____copies of each installment of your DIGEST. I understand that this service in no way obligates me to NCC or to the use of its products.

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____
(please print or type)

Dept. MC 12-4

The term "National", the Three Pyramids device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

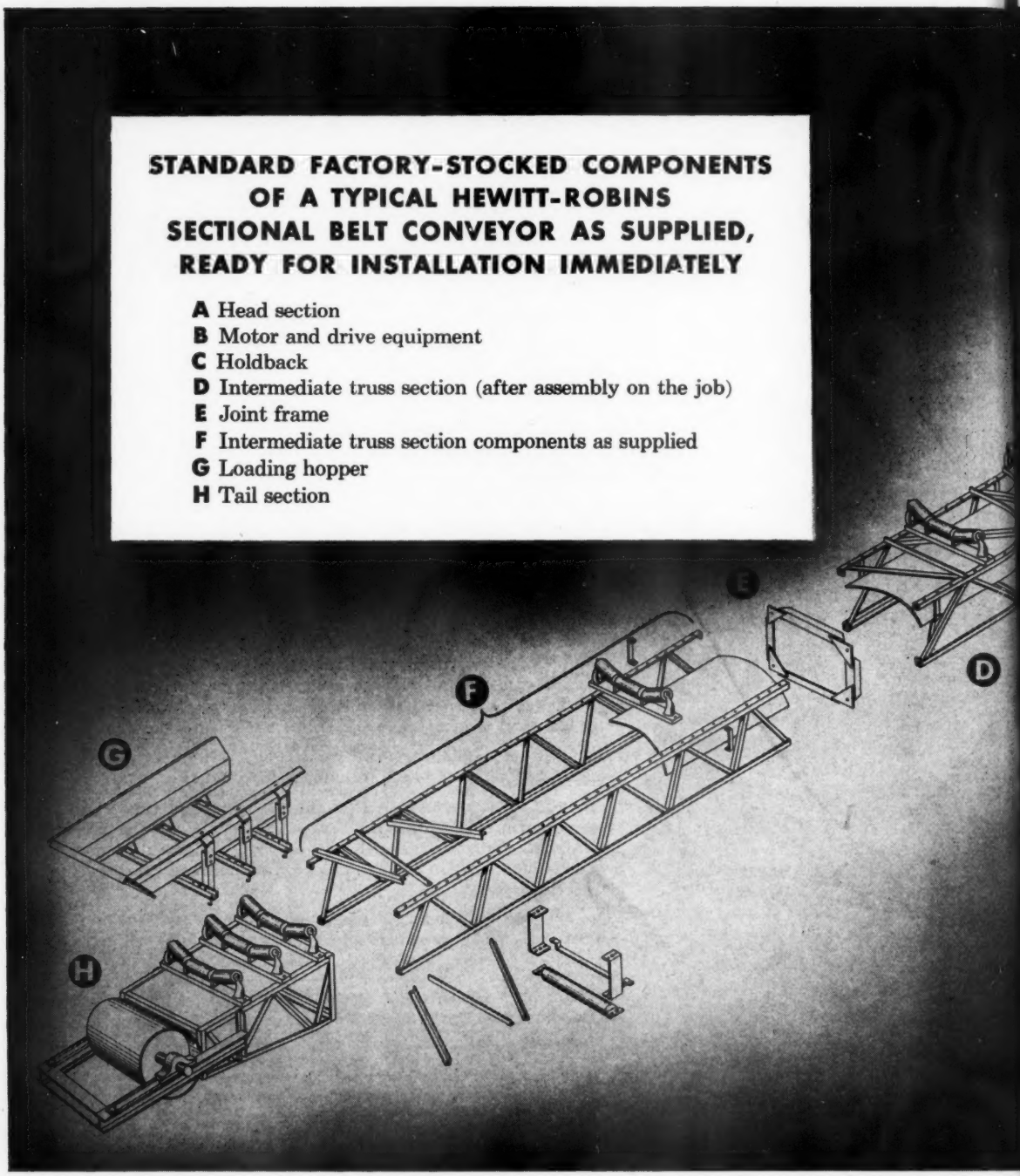
District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

IN CANADA: Union Carbide Canada Limited, Toronto

Order Your Belt Conveyo

STANDARD FACTORY-STOCKED COMPONENTS OF A TYPICAL HEWITT-ROBINS SECTIONAL BELT CONVEYOR AS SUPPLIED, READY FOR INSTALLATION IMMEDIATELY

A Head section
B Motor and drive equipment
C Holdback
D Intermediate truss section (after assembly on the job)
E Joint frame
F Intermediate truss section components as supplied
G Loading hopper
H Tail section

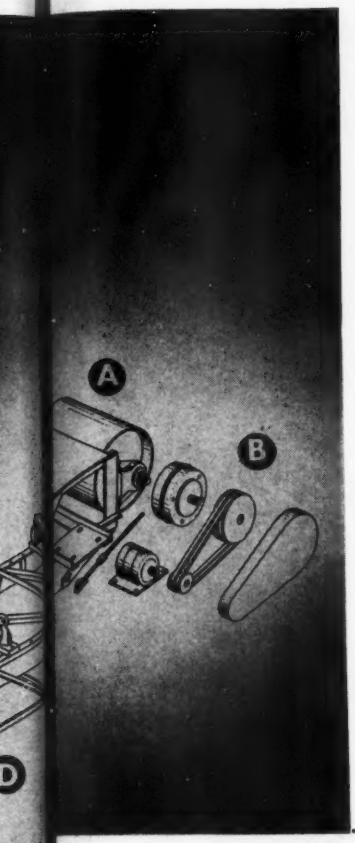


HR

HEWITT-ROBIN

EXECUTIVE OFFICES, STAMFORD, CONNECTI

ight From Factory Stock



Save Time and Money . . . Install your own Hewitt-Robins Sectional Belt Conveyor from Easy-to-assemble Factory-built Components

Now, for the convenience of large and small plant operators alike—Hewitt-Robins offers a standardized sectional conveyor adaptable to a wide variety of uses.

Hewitt-Robins Sectional Conveyors consist of completely assembled factory-stocked components that can be quickly and economically installed and maintained by your own personnel.

When you order a Hewitt-Robins Sectional Conveyor you can be sure of prompt delivery . . . all components and parts from machinery to belting are shipped to you direct from standard factory stocks . . . saves you time and saves you money.

For prompt information about the Sectional Conveyor and any other Hewitt-Robins bulk material handling products, contact the Hewitt-Robins office nearest you or write direct to Passaic, New Jersey.

ENGINEERING DATA

PLICATION: Designed to han- bulk and packaged materials re special limitations and condi- s do not require the use of om-engineered belt conveyors.

TERIALS HANDLED: Sand, vel, run-of-mine ore, coke, stone, , gypsum, grain, sugar beets and other bulk materials that can be dled more efficiently and eco- ically by belt conveyor.

PACITIES: From 20 to 500 TPH belt speeds from 200 to 450 feet minute.

ANDARD WIDTHS: 18", 24", 36".

NGTH: From 15'6" up to any length consistent with good conveyor practice . . . inclines up to 22½°.

STANDARD HORSEPOWER: From 2 to 30 hp.

IDLERS: 4" or 5" diameter troughing and return idlers available. Both types have exclusive Hewitt-Robins patented Triple Grease Seal and one-shot lubrication.

BELTING: Complete selection of all Hewitt-Robins standard stocked belts. Special belts available when necessary.

INSTALLATION: All standard factory-assembled components are clearly labeled and shipped with complete instructions, for quick, easy assembly by your own personnel.

Write for Bulletin #132-B on your company letterhead

Here is a partial list of
HEWITT-ROBINS PRODUCTS
that will help you cut handling costs and increase operating efficiency

MACHINERY:
- Belt Conveyors
- Belt & Bucket Elevators
- Car Shakeouts
- Screen Cloth
- Vibrating Conveyors & Screens

INDUSTRIAL RUBBER PRODUCTS:

BELTING:
- Conveyor
- Elevator
- Transmission

HOSE:
- Hewitt-Robins makes over 1,000 different types of industrial rubber hose, including Twin-Weld®, the patented twin-line welding hose.

For information and service on industrial rubber products, contact your Hewitt-Robins Industrial Supply Distributor. Through his complete stock of Hewitt-Robins Rubber Products, and his familiarity with local field conditions, he can fill your supply needs promptly and correctly. See Classified Phone Book for the Hewitt-Robins Industrial Supply Distributor serving your area.

3081

NCORPORATED

STIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
GN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, France • Robins Conveyors (S. A.) Ltd., Johannesburg • **EXPORT DEPARTMENT:** New York City.

This special drill rig, designed by Anthony Schacikoski, General Superintendent of Leechburg's mining operations, makes drilling easier—takes full advantage of Kennametal roof bits and the Jeffrey drill.

Kennametal* HFD roof bits last longer than other carbide bits at Leechburg Mining Company

At Leechburg Mining Company's Park Mine, tests were made of Kennametal HFD 1⅜-inch roof bits and other carbide bits of the same diameter. Using a Jeffrey A-7 Drill with shop-made rods and drilling rig, holes two feet deep were drilled into hard, brittle slate having a one-inch pebble streak.

Four holes were drilled with the other carbide bits under test before reconditioning was necessary. Under the same conditions, 14 holes were drilled with Kennametal before resharpening, reducing bit cost to ⅓ of what it was formerly.

Kennametal bits last longer because they're made better. They have shock and wear-resistance qualities superior to any other tungsten-carbide bits in the industry. Try them. Your bit costs will be less. You'll spend less time resharpening and changing. You'll drill more holes per man, per machine, per hour. Your Kennametal representative, a veteran having many years of mining experience, will help you put the right tool on the job. Call him, or write: KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania.

National Mine Service Company

National Mine Service appointed Kennametal dealer

Complete stocks of Kennametal mining tools are now available at all National Mine Service warehouses . . . Indiana and Forty-Fort, Pa., Beckley and Logan, W.Va., Jenkins and Madisonville, Ky. Kennametal service and sales personnel work with those of National Mine Service in giving tool performance demonstrations and reconditioning instructions and to help you in tool selection.

A third less manpower A third more drilling

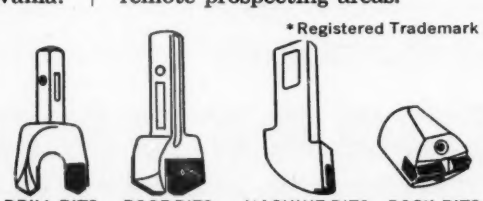
Use of the Kennametal RD 1⅝-inch bit resulted in both easier drilling and lower drilling cost in an anthracite measure at Rogers Bros. Co., Scranton, Pa. Simply by changing to this bit, two men are now drilling ⅓ more each shift than previously drilled by three men in the same length of time.

New—Uranium prospector's drill

Kennametal recently introduced a carbide-tipped hand drill for uranium prospectors. This new tool stays sharp much longer than conventional drills, greatly reducing the load of drills to be carried into remote prospecting areas.

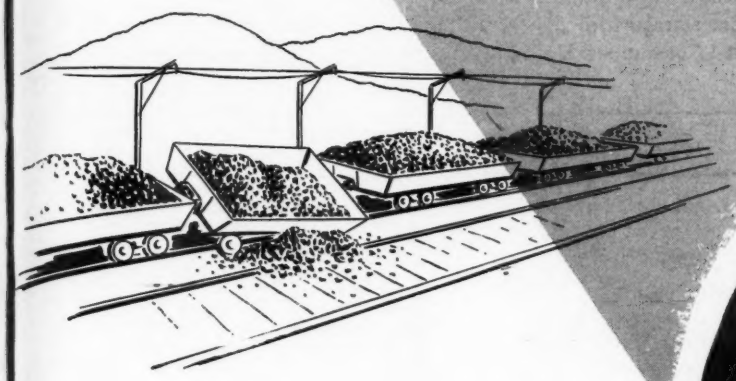
*Registered Trademark

INDUSTRY AND **KENNAMETAL** . . . *Partners in Progress*



DRILL BITS ROOF BITS MACHINE BITS ROCK BITS

answer to 'splitting' headaches



NEW "LOAD SUPPORT" MINE CAR WHEELS

STOPS TREAD SPLITTING because new type curved plates give treads full support at center of loading.

STOPS "BREAK-OFFS" because overhang of wheels is reinforced by more metal.

REDUCES "FLAT SPOTS" AND "LOAD LIFTING" because treads are ground concentric to the bore.

WEARS LONGER because treads are QUICK CHILLED into a harder, uniform abrasive-resistance across full tread surface. This also assures longer-lasting rotundity.

DELIVERS MORE SERVICE ...can take more punishment... because all sizes feature heavier, more rugged construction.

COSTS COMPETITIVE WITH ORDINARY WHEELS. Yet results in fewer replacements... fewer work stoppages ...improved "runability" that takes less power.

Your nearby **a c f** Representative will gladly give you all the latest facts about this great new advancement in mine car wheels. And remember, he can save you money on replacements for *any part* of your mine cars. **a c f** Industries, Incorporated, New York · Chicago · St. Louis Cleveland · Philadelphia · Washington · San Francisco Berwick, Pa. · Huntington, W. Va.

acf

MINE CARS

for Constant Haulage

How Well Does Your Present Source Compare With National's COMPLETE Facilities For Motor and Generator Repair

Most motor repair shops can perform some of the operations listed below. Very few can handle them all. These are not routine operations, but extras which require expensive specialized equipment and experience. National service includes all 17 operations. How does your present repair source compare?

plus value operation	*available at National*	*at your present repair source*
1. redesigning and modernizing by competent engineers	yes	
2. vapor degreasing to insure good bonding of varnish	yes	
3. corncob blasting to prepare surfaces like new	yes	
4. rebuilding and remachining to standard of mechanical fits	yes	
5. temporary hotbanding to seat coils in slots	yes	
6. hot rerolling of permanent bands	yes	
7. grinding and polishing of journal shafts	yes	
8. vacuum impregnating	yes	
9. dynamic balancing	yes	
10. grinding and polishing of commutator at top operating speed	yes	
11. load testing	yes	
12. high frequency testing	yes	
13. electronic bar-to-bar and high sensitivity ductor testing	yes	
14. surge comparison testing	yes	
15. high potential ground testing	yes	
16. magniflux testing	yes	
17. anti-friction bearing inspection	yes	
Total	17	

If you can't answer "yes" for your present source on all 17 operations, you're taking unnecessary chances on getting less than the best repair work. You can't tell in advance on which jobs National equipment and National know-how will pay off in improved performance or longer life. So play it the one safe way — make National your first source for *all* motor and generator repairs.

For more details on why the motor or generator you send to National will often come back better than new, call your nearby National field engineer today. Or drop us a line for his name and address.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A. TRADE MARK

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

new!

ATLAS *Shotmaster* BLASTING MACHINE

The first condenser discharge type blasting machine utilizing a high voltage DC generator directly connected to charge the condensers.

Dependable blasting starts with a dependable blasting machine. And this new Atlas blasting machine is designed to give you every advantage in dependability and safety.

Hand actuated generator operation does away with battery replacements and gives consistent voltage in both hot and cold weather.

Built-in Volt Meter shows actual voltage while the condensers are being charged.

Adequate voltage assured. The condensers cannot discharge into the firing circuit below a predetermined voltage.

No danger of a residual charge in the condensers. With the condensers connected directly to the generator, any residual charge is dissipated quickly.

Simplified operation. The generator is hand operated. The firing trigger may be closed or open during the voltage build-up. Only when the voltmeter needle indicates optimum power can the firing circuit be activated.

Waterproof. The entire unit is sealed and the switch is waterproof. The new Atlas blasting machine is always ready to go . . . under all conditions.

Sturdy, welded steel case is compact and easy to handle. The whole machine weighs only 30 lbs.

Insulated-type terminals. Binding post screws are made of a non-conducting material. Terminals are well separated for maximum safety.

For complete information on this new blasting machine, get in touch with your Atlas representative. He will be glad to give you full details and arrange a demonstration if you wish.

ATLAS

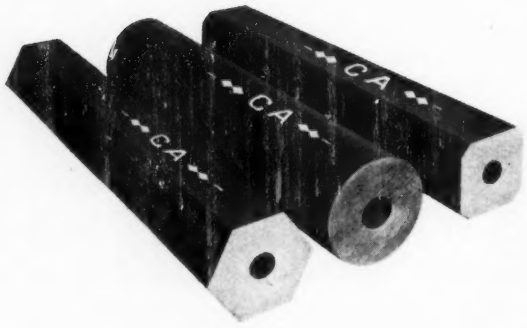
ATLAS EXPLOSIVES

"Everything for Blasting"

ATLAS POWDER COMPANY,
WILMINGTON 99, DELAWARE

Offices in principal cities

TEAMED FOR DRILLING EFFICIENCY....



Crucible CA Double Diamond Alloy Hollow Drill Rods

Crucible HY-Tuf for tungsten carbide bit bodies

Here's a combination you just can't beat . . . detachable bits of Crucible HY-Tuf® alloy steel with tungsten carbide inserts and Crucible CA Double Diamond® Alloy Hollow Drill Rods . . . the toughest, longest-lasting drill steel made.

HY-Tuf detachable bit bodies are made to withstand the terrific pounding of heavy rock drills . . . pounding which no ordinary steel can possibly take. And Crucible CA Double Diamond Rods give you superior drilling performance with minimum rod breakage and bit losses . . . a *team* that provides the *lowest cost per foot of hole drilled.*

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW DRILL ROD**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

22-ton "Eucs" with quarry bodies haul stone for Ideal Cement Co. of Colorado. Top speed of this Model 36 TD, with full payload, is 32.5 m.p.h. Spring mounted drive axle and Allison Torqmatic Drive are important factors in stepping up production and profits at this operation.

EUCLID DIVISION
GENERAL MOTORS CORPORATION
Cleveland 17, Ohio

Higher Availability
More Tonnage
Lower Costs

On scores of mine and quarry operations all over the world the high job availability of Euclid equipment results in more tons hauled per shift. Because they're engineered and built for the toughest off-the-highway service, "Eucs" stay on the job longer, with less time out for servicing and repairs.

Dependable low cost hauling has made Euclid the preferred equipment for open pit operations in both the metallic and non-metallic mining fields. If you're interested in cutting your hauling cost for ore, overburden or waste, have your Euclid distributor prepare a production and cost estimate for your operation. There's a good chance he can show you how to haul more tonnage at lower cost.

Rear-Dump models are available in 10, 15, 22, 34 and 50 ton capacities with engines of 165 to 600 h.p. . . . semi-rigid or spring mounted drive axles . . . standard transmissions or Allison Torqmatic Drives.

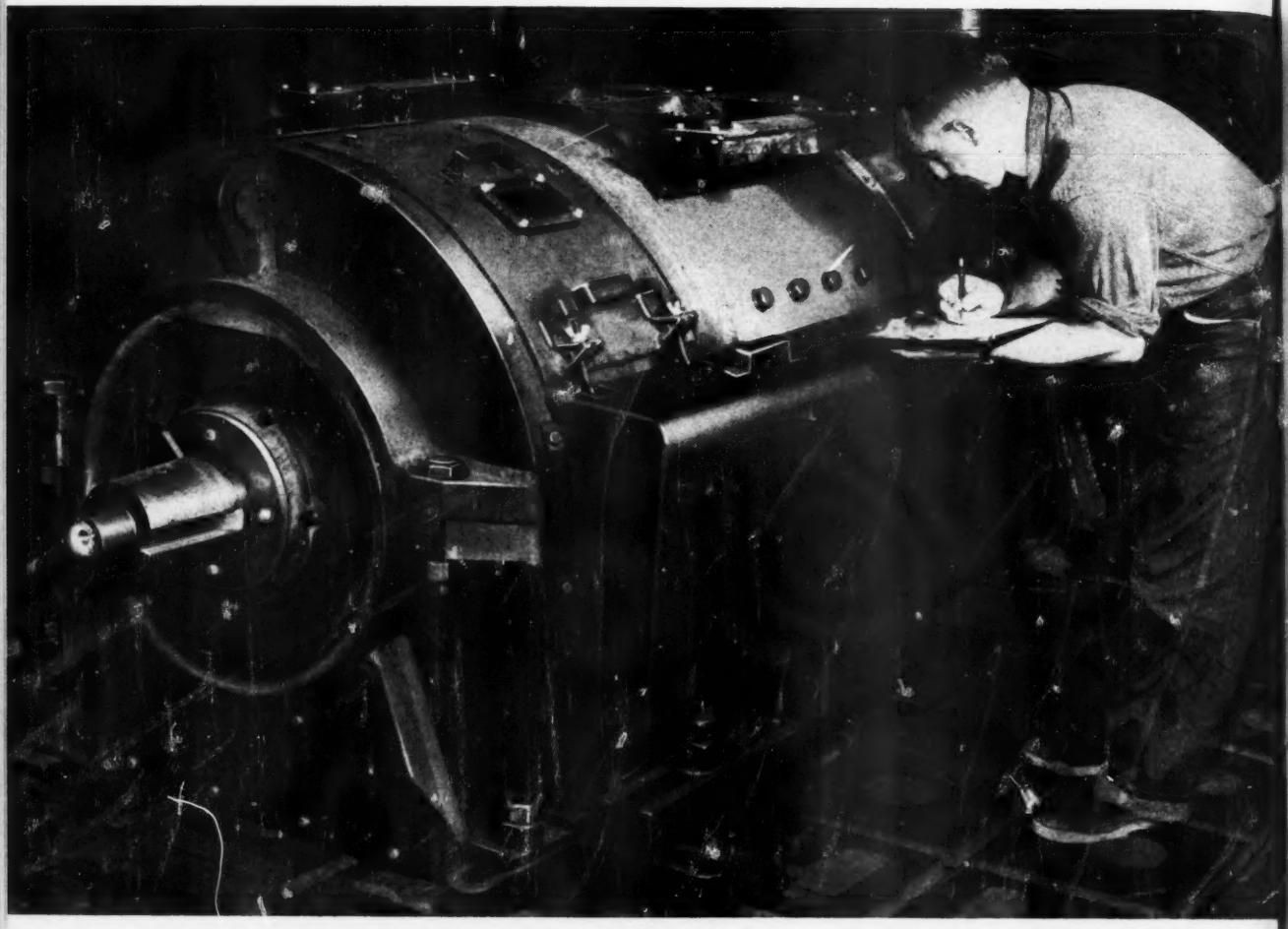
EUCLID THE FIGHTER

Euclid Equipment

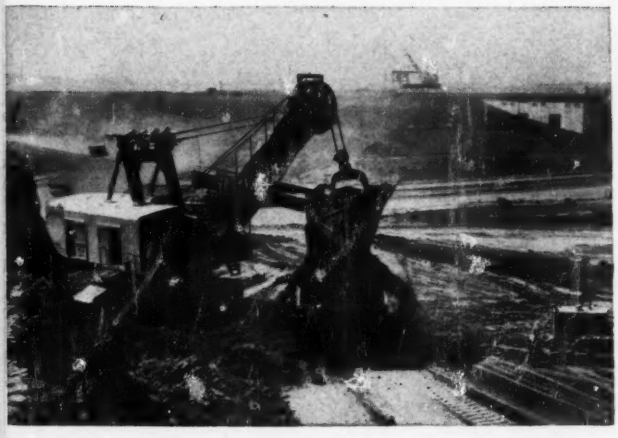
FOR MOVING EARTH, ROCK, COAL AND ORE

GM GENERAL MOTORS

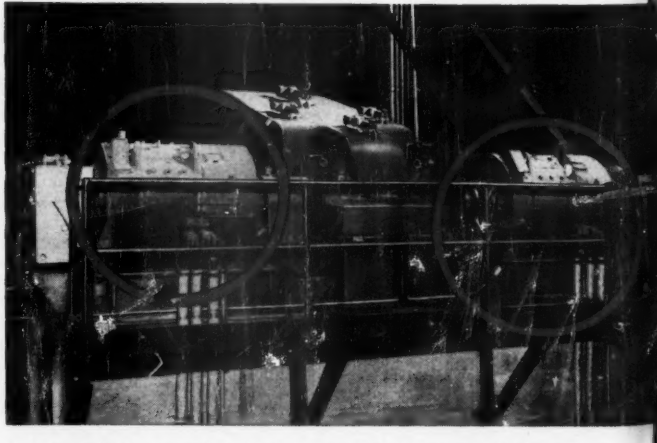
NEW G-E Armored Mill Motor—



TO ASSURE YOU of dependable service, this MD-622 is undergoing the rigid tests given to all G-E Armored Motors before shipment.



POWER SHOVEL equipped with compact G-E Type MD motors which have high overload capacity and the ability to take the terrific shocks of excavating duty.



SLAB SHEAR in reversing, blooming and slabbing mill is typical of severe applications in the steel industry that are dependably powered by G-E armored motors.

Most Powerful in its Class

Another G-E "first"—the MD-622—gives you more horsepower and torque than any other mill motor!

POWER-PLUS for the toughest heavy-duty application—that's the job of the MD-622—General Electric's latest addition to the MD-600 Armored Motor line.

AISE OBJECTIVES set up for smaller motors of this type, are met in the construction of the MD-622, which gives you more horsepower, increased commutating ability and better speed regulation in the same mounting dimensions as the earlier motor. Designed for duty in steel mills, power shovels, mine operations, dredges and ore bridges, it's ideal for extra torque, high momentary loads and snappy reversals.

RATED 500 HP AT 350 RPM when force ventilated, this motor delivers more torque relative to its size than any other mill motor ever built.

BETTER SPEED REGULATION can be maintained at higher speeds than in previous motors—and maximum safe speed is 20% higher.

WIDER SPEED RANGE is possible with the adjustable speed MD-622 and stabilizing series windings are not required, simplifying control on reversing operations.

REDUCED MAINTENANCE due to integral feet on armature. Out of frame, it stands by itself. Armature spider allows replacement of shaft without disturbing windings.

FOR NEW BULLETIN on MD-600 motors, fill out the coupon below. If you need more information, contact your nearest G-E Apparatus Sales Office. General Electric Co., Schenectady 5, N. Y.

Please send Bulletin GEA-1654C, "DC Armored Motors," which gives the complete story on the MD-600 line with examples of their reliable performance throughout industry.

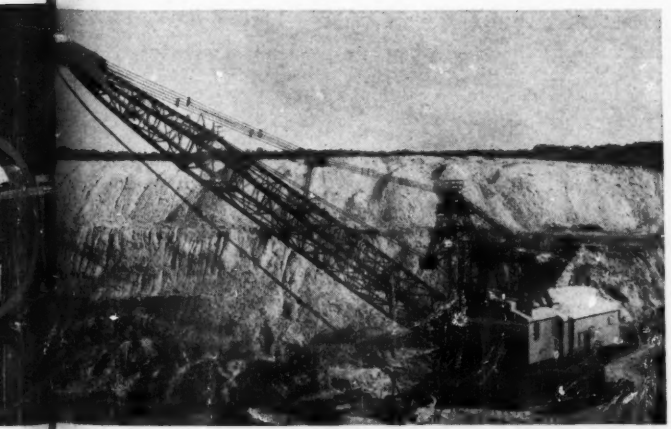
General Electric Co.
Section L810-3
Schenectady, N. Y.

☐ Planning an immediate project.
☐ For reference only.

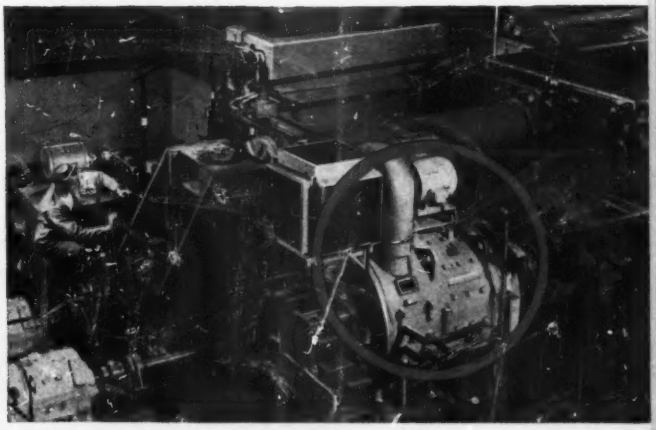
NAME.....
COMPANY.....
ADDRESS.....
CITY..... STATE.....

Progress Is Our Most Important Product

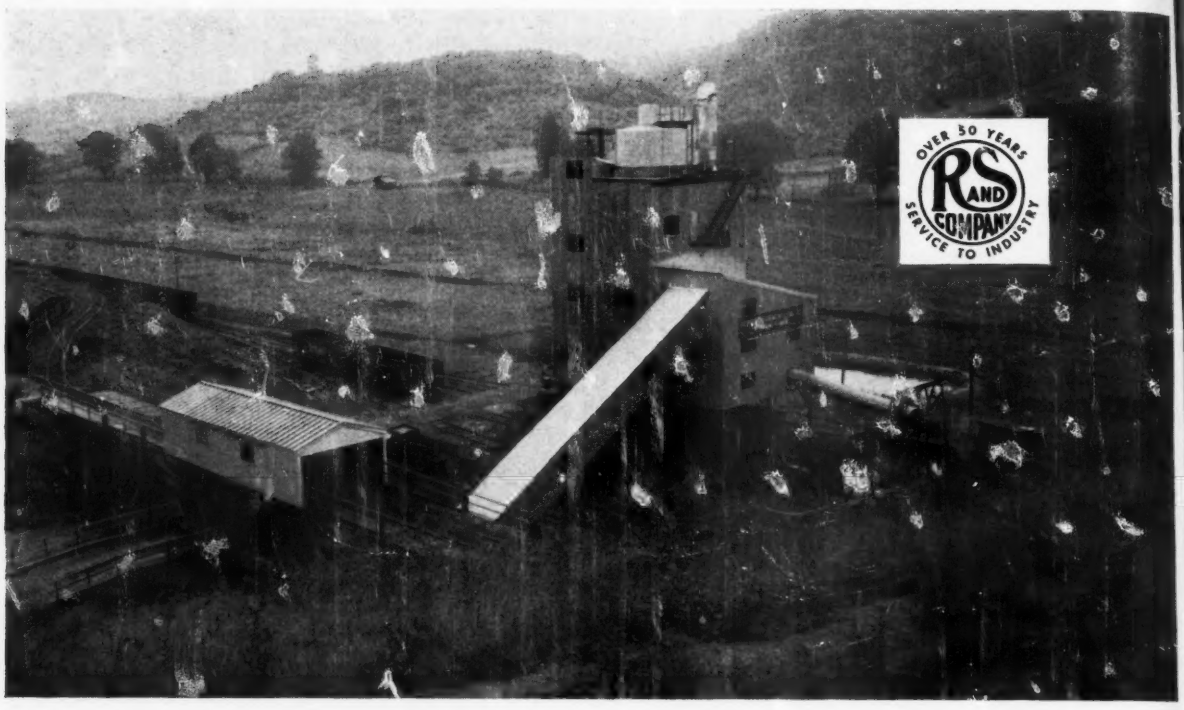
GENERAL ELECTRIC



DRAGLINE powered by amplidyne-controlled G-E armored motors—which were selected because of their high torque and quick reversing characteristics.



COILER in hot strip mill driven by force ventilated G-E armored motor with extra horsepower and mechanical strength to withstand severe operating conditions.



A functional job

for a progressive independent operator

Roberts & Schaefer engineers approached the plans for this 150-ton per hour processing plant for the Scott #4 Mine of Reppert Fairmont Coal Co. with the same enthusiasm and thoroughness that are devoted to all engineering studies—whether involving 50 or 1000 tons per hour capacity. Regardless of the size of a given project, it receives the full benefit of our more than fifty years of knowledge and experience.

The preparation plant for the Scott #4 Mine at Buckhannon, W. Va., utilizes a combination air and water cleaning process to secure the most economical and satisfactory end results. It incorporates the R & S Airflow Cleaner which has proved so successful in air washing coal and the R & S Package-Unit Hydro-Separator for wet washing coarse coal. The completed plant is now in operation and is functioning to the entire satisfaction of both designers and owners.

This is still another example of the ingenuity and skill of Roberts and Schaefer engineers. Our organization has engineered, constructed and equipped a great number of successful preparation plants of all types both in this country and abroad. Take advantage of our experience when you require a one-source solution of your coal preparation problems.

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★ Mining CONGRESS JOURNAL ★

Published for the Entire Mining Industry
by the AMERICAN MINING CONGRESS
JOHN C. FOX, Editor

VOLUME 40 DECEMBER, 1954 NUMBER 12

On With the New Year

AT THE end of one year and the beginning of the next, it is logical to review the past twelve months and to plan for what the new year may bring.

Looking backward, most important event of the year for mining may well have been the official recognition by the President of just how important mining is to this country, both militarily and for the civilian economy. It is encouraging to have an administration that seeks to avoid any action that will hurt the industry or impede its development—although there does seem to be a good deal of difficulty in adopting measures to cure the ills of certain segments of mining—notably coal, lead-zinc, fluorspar, and some of the other critical and strategic materials which are hard hit by imports from countries where labor shares to a lesser extent in the wealth it produces.

The Cabinet Committee formed by President Eisenhower a little over a year ago to formulate recommendations for a national minerals policy has made its report. It has presented a list of eleven suggestions designed to foster the orderly development and conservation of our national resources (see page 74 of this issue). Nine of these can be implemented by already existing authority. The other two, having to do with adjustment of the tax structure to remove deterrents to mineral development and amendment of the mining laws to encourage prospecting by scientific methods, require Congressional consideration.

Although the long range future of coal mining is bright the industry today is beset with grave difficulties. These are under study by two Cabinet Committees headed by ODM Director Arthur Flemming and by a Governors' Fuel Conference patterned after the Western Governors' Mining Council. Industry task forces have prepared data with regard to taxes, residual fuel oil imports, natural gas, Government fuel buying, freight rate structures and foreign outlets for coal. Here again, some of the measures suggested could be put into effect by executive action while others would have to go to Congress. The announced objective is a mobilization base of current production and capacity capable of being expanded rapidly to meet the needs of an all-out emergency.

The 83rd Congress can well be proud of its accomplishments. Among the 3516 bills it passed were many that affect the mining industry. One of the most important was the complete revision of the Internal Revenue Code, and adoption of many provisions long advocated by the mining industry.

Congress also refused to weaken the Taft-Hartley Act and passed the Communist Control Act. Both actions serve to protect the American workman who has a desire to work.

Through its stepped-up stockpiling policy, the Government has taken action to temporarily alleviate the situation in which the lead-zinc industry was placed by the flood of foreign importations. As the year ends, prices of both these metals reflect the results of this policy. Government buying and other assistance has resulted in the growth of uranium mining into a $100,000,000 industry, and has helped maintain a core of productive capacity for some of the other strategic minerals.

The traditionally glamorous gold mining industry is still in the doldrums, squeezed between rising costs and a Governmentally fixed price for its product. A drive for a free market for gold may be in the making.

Coal production through the end of November was down 16 percent from a year ago but the industry shows unmistakable signs of climbing out of the slump which has plagued it. Coal's biggest consumer, the electric utilities industry, continues to make new records and in doing so is using more coal than ever. Steel production continues to mount, and every ton of iron ore that goes into steel making is matched by a ton of coal used. FOA's program to encourage exports of coal from American mines was beginning to bear fruit as the year ended.

Accelerated industrial and construction activity will no doubt call for increased production of iron ore, nonferrous metals, cement, rock products and other minerals; in particular the announced expansion of highway construction may require a substantial increase in cement capacity and production.

Light metals have continued to develop and broaden their markets. Aluminum output is exceeded only by steel; magnesium production continues to skyrocket and titanium metal production is expected to double again next year.

Trebled fertilizer consumption has paced the expansion of mining activity in potash and phosphate, as well as sulphur. This trend will continue, with the industry well prepared to meet the increased demand.

Taken all in all, although 1954 has been a trying year for some parts of the mineral industry, it has been one of progress. It is up to the mining men of this country to see that 1955 lives up to its promise of better times for all. This will call for fullest cooperation with their representatives in Washington and for unremitting attention to improvements in operation at their own properties.

Operating Record of a West Virginia Dense Medium Cleaning Plant

Part I—Mechanization With Full Seam Mining Made Cleaning Plant Changes Imperative

By DONALD H. DOWLIN and EDWARD JOLLY
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Youngstown Mines Corp.
and
D. R. MITCHELL
Head, Dept. Mineral Engineering
The Pennsylvania State College

THE Dehue Mine of the Youngstown Mines Corp., a wholly owned subsidiary of the Youngstown Sheet and Tube Co., Youngstown, Ohio, is located at Dehue, Logan County, W. Va. The seam mined is the Number 2 Gas, locally called Eagle, and issued solely for by-product coking. Extraneous ash is the principal impurity removed in the preparation plant. Sulphur is no problem.

The present coal washing plant was started September 12, 1949, and has given very satisfactory results. Prior to the building of the washer and complete mine mechanization, hand loading was practical and impurities removed by hand picking. A good product was obtained but the change to full seam mining with mechanical loading necessitated more efficient coal cleaning methods.

Seam Characteristics

The coal seam varies in thickness from 60 to 70 in. with either sandstone or slate roof and fire-clay bottom. The coal seam includes two high ash bands; one, bone coal, and the other, splint coal. The bone coal analyzes approximately 25 percent ash with much of the material floating at 1.45 sp gr. The splint coal analyzes 18 per cent ash, and approximately 50 percent floats at 1.45 sp gr. Considerable roof rock got into the mined product until the advent of roof bolting. Successful installation of roof bolts has greatly reduced contamination of the mined product by roof rock. The bottom is a soft, brittle fire-clay and breaks up under the weight of heavy equipment. Some of this material is loaded with the raw coal and becomes a problem in the preparation processes.

Before the plant was designed, extensive float-and-sink tests were made, with special attention being paid to the bone and splint coal bands. Results of one of these tests are given in Table I.

Bone and splint coal bands are persistent. They vary slightly in thickness and properties, and constitute from 10 to 15 percent of the coal seam. Being intermediate in specific gravity, and constituting an appreciable percentage of the seam thickness, their presence in the mined product creates a special washing problem. Washability studies of the mined product gives from 15 to 30 percent near gravity material (±0.10 sp gr) at washing gravities.

A careful study of all conditions and tests of the mined product from an experimental mechanized full seam mining section revealed that it was possible to meet final product specifications of 7.5 percent ash by washing only the plus ¼-in. material and bypassing the minus ¼-in. raw coal, provided a washing process was selected capable of making a precise specific gravity separation.

An underfed, wheel type, dense medium washer was selected.

Flow

The flow of feed and products is given in Fig. 1. The run-of-mine material is hoisted in mine cars, discharged automatically into two 3½-ton capacity feed hoppers. Originally two 72-in. high-intensity oil-filled double-gap spout magnets were installed in the hopper discharge bottom plates to remove tramp iron. These were entirely unsatisfactory as the sliding speed and depth of material did not permit good operation. Little tramp steel was reclaimed and the magnets were removed March 1950. Their installation was a misapplication.

Originally the run-of-mine coal discharged directly from the hopper onto bar grizzly screens with four-in. openings. The units were mounted so that the pitch could be varied between 25° and 35°. The grizzly screens proved unsatisfactory since the material slid across the bars too fast and only a small amount of the minus four-in. size passed through.

Poor sizing by the bar screens resulted in an overload on the following shaking screen and a carry-over of unwanted fines into the dense medium washing circuit. To correct this, each bar grizzly was replaced in October 1949 with a 6 by 12-ft single-deck, heavy duty, vibrating screen equipped with manganese steel plates with four-in. square openings on 4¾-in. centers, both ways. The screens were mounted on rubber pads, to minimize vibration of the tipple structure. This was a prime requisite in the selection of this unit, as the equipment had to be rugged to withstand 3½-ton impact loads, and vibration free. When the vibrating screens were installed, air operated gates were built into the feed hoppers to control the material flow onto the screens. The dump operator in the head house controls these gates in addition to his mine cage dumping duty. The combination of feed gates and vibrating screens has successfully eliminated fines carry-over. Since installation, this equipment has required only routine maintenance and the screen plates show practically no wear.

The minus four-in. raw coal product passes through air operated louvers beneath the screens into a 100-ton storage bin. When mine rock is hoisted, the louvers are closed and the undersize material rejoins the carry over product. The louvers work satisfactorily except when wet, sticky reject material passes over them. This occasionally sticks to the louvers and must be removed before they are opened; otherwise the minus four-in. coal is contaminated, with serious difficulty in the cleaning circuit.

Plus four-in. material, coal and rock, goes into a 50-ton storage hopper from which it is discharged by a four-speed plate feeder onto a single

TABLE I—FLOAT-AND-SINK TESTS OF BONE AND SPLINT COAL

Specific Gravity	Bone % Weight	Bone % Ash	Splint % Weight	Splint % Ash
1.40 Float	2.29	18.00	12.26	12.12
1.40 x 1.45	25.46	22.60	46.03	17.60
1.45 x 1.50	16.71	29.40	32.89	20.08
1.50 Sink	55.54	35.04	8.82	26.56

deck shaking screen. The reciprocating plate feeder utilizes eccentrics, with stroke adjustable from a six-in. maximum to a one-in. minimum. It is powered by a 10-hp motor and has operated trouble free.

Lump Picking and Crushing

The shaking screen-picking table unit is suspension mounted and driven through a cam shaft at 100 strokes per minute with a four-in. throw. It is six ft wide and 24 ft long. The shaking screen section from feed to tail end consists of 19 in. of solid plate, 46 in. of one-in. round hole punched plate, and 82 in. of short lip screen plate having openings two in. wide, eight in. long, and a two-in. step. The lip screen plate is manganese steel. The bottom of the shaking screen is fitted with a gate to permit returning the minus one-in. fines to the minus four-in. run-of-mine coal; or mine rock, passing the screen, can be sent to rejects. Undersize from the lip screen passes to the coal crusher and then joins the washer feed or is passed to refuse via the rock crusher if mine rock is being hoisted.

The picking table section is arranged so that coal can be picked from rock or rock picked from coal. Two men work the picking table, one on each side. They control the coal and rock flow by air operated gates, regardless of which is being hand picked on the picking table. In addition, foreign objects, such as mine posts, cap pieces and scrap steel, are removed. Serious damage to plant equipment could result if this were not done.

The shaking screen-picking table, installed in 1948, is the only unit remaining from the original tipple. At present the second set of lip screens is in use, the first set having been removed in April 1953 after 7863 hr of service. The driven screen is by means of cams on shaft. This is not altogether satisfactory and consideration is being given to replacing the cam shaft drive with a crank shaft floating drive. Similar drives are in use at other properties of the company and are trouble free.

The coarse rock is reduced to an eight-in. size in a 21 by 42-in. single-roll, heavy-duty, rock crusher and disposed of by aerial tramway. Purchase specifications required that it handle material up to 24 by 24 by 16-in. maximum size. The coal crusher is a 21-36-in. single-roll, heavy-duty, rock-type crusher, giving a product with a top size of about eight-in. Purchase specifications required that it handle material up to 24 by 36 by 12-in. maximum size. Both crushers are powered by 50-hp motors and have given excellent continuous service. Only one new set of roller segments on the rock crusher has been required. These were installed in May 1953. The crushers are designed so that when tramp steel enters the throat, a spring arrangement releases the crushing plate, to permit free passage of the object. The crusher then resets automatically. Both crushers are of similar construction with the roll having three replaceable segments with hard surfaced teeth. Crushing plates are lined with three-in. thick replaceable and interchangeable steel liner plates. Side wearing plates at the ends of the roll are one-in., high carbon steel.

Secondary Sizing

Minus four-in. coal from the primary storage bin is fed by two 48 in. wide by 60 in. long vibrating feeders to two 6 by 14-ft suspended double-deck vibrating screens. The feeders

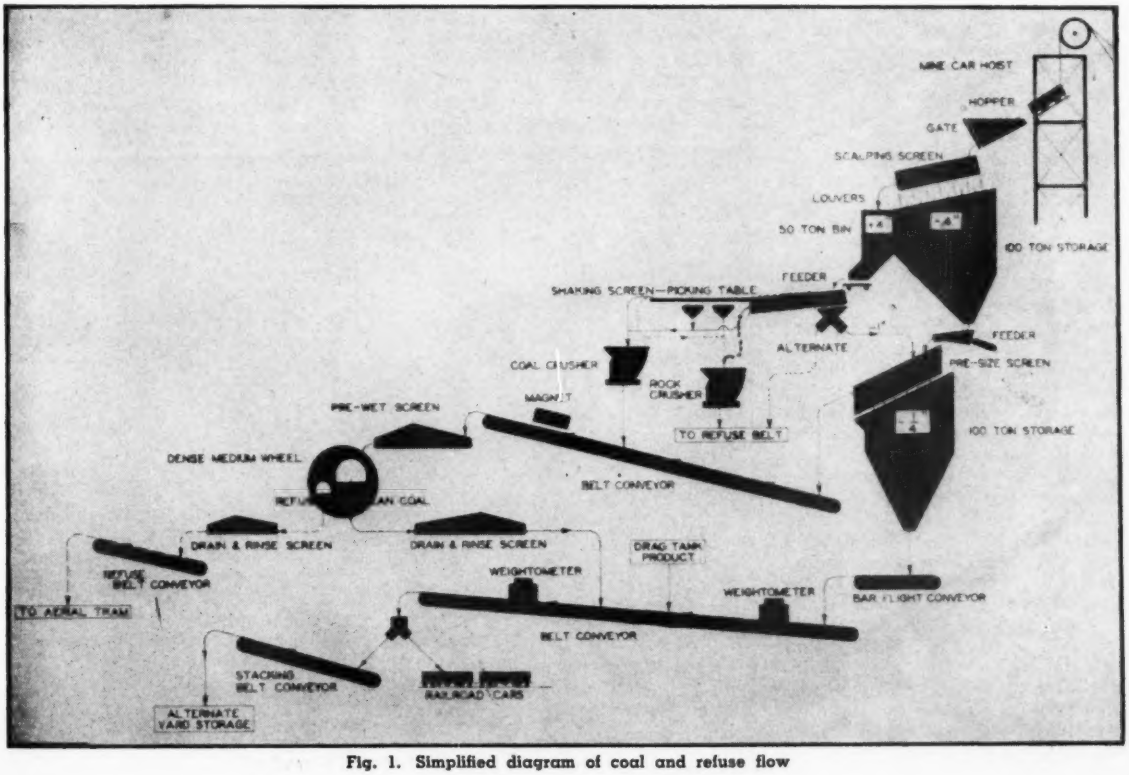


Fig. 1. Simplified diagram of coal and refuse flow

have rheostat control, allowing feed rates from 150 to 225 tph. These feeders have been entirely trouble free.

First sections of the top deck of the vibrating screens were first equipped with cloth having 1½-in. square opening and made up of ¼-in. diameter spring steel wire. The second and third sections had ¾-in. square openings and 0.177-in. diameter spring steel wire. The bottom deck had 7/32 by 3⅛-in. openings and 0.072-in. diameter spring steel wire to make approximately a ¼-in. square separation. Long dimension of the opening was at right angles to the flow. Undersize goes directly to a 100-ton slack bin; and the 4 by ¼-in. oversize passes to the washing section, being joined enroute by the crushed coal from the picking table.

The screen cloth, as installed, blinded easily when wet or damp coal was fed to it. Units are completely enclosed, so visual inspection during operation was impossible. Therefore, periodic inspection was required. The screens were thoroughly cleaned about once every two hr. Between inspections they could easily blind, permitting the minus ¼-in. fines to pass to the coal washing section. These screen cloths were removed April 1952 and replaced with stainless steel wedge wire screen cloth, 3/16-in. clear opening, mounted in one-in. square rubber with six panels per screen. This screening surface has been entirely trouble free and is self-cleaning. Tests show that the carry over of undersize is about the same as with the original screen cloth when clean, approximately three percent. Prior to this change a total of 12 screen sections had been replaced because of wear. The wedge wire screen cloth is still in service and shows little wear. Other maintenance has been negligible.

The 4 by ¼-in. screened product is directed to a 36-in. belt conveyor, 40 ft long, inclined up at about 18°. It carries a maximum of 260 tph of raw coal at 386 fpm.

This conveyor discharges to a 6 by 14-ft horizontal single-deck vibrating screen having a 7/16-in. amplitude and 940 rpm speed. The unit is suspension cable mounted and driven by a 10-hp, 1750-rpm motor, V-belt drive. This unit removes all minus ¼-in. fines, and wets the feed to the washer. The screen was originally equipped with sizing cloth of 0.116 by 0.546-in. openings with 0.120 in. diam parallel wire and 0.135 in. diam tension wire. Slots are parallel to the length of the screen. It was protected with ¾ by 9-in. opening, ¼ in. diam spring steel wire cloth on the first section and with one by 9-in. opening, ¼-in. spring steel wire cloth on the remaining portion of the screen. The long dimension of the cloth was parallel to the length of the screen.

During early plant operation, difficulty was encountered with improper separation in the dense medium washing vessel. This was due to excessive fines in the medium with improper prescreening being largely responsible. The 0.116 by 0.546-in. cloth was removed and replaced with stainless steel cloth of 0.092-in. diam wire with ¼-in. clear opening in both directions. This change and redesign of the rinse water spill box practically eliminated fines carry-over to the washer.

The ¼-in. clear opening screen cloth gave a reasonably satisfactory life of 1200 hours. However, it was replaced with wedge wire, 3/16-in. clear opening, mounted in one-in. square rubber. Six panels were used per screen. This change gave satisfactory screening and has been justified, since the wedge wire has already exceeded by three times, the life of the wire cloth. Maintenance of the screen as a unit has only amounted to routine servicing.

Washing

The pre-wet plus ¼-in. coal passes by chute to the feed opening of the dense medium washing unit. See Fig. 2. The washer is 10 ft in diameter and seven ft wide with a rated capacity of 250 tph. It is driven by a 7½ hp, 1750 rpm motor through a 70.2 to one herringbone gear speed reducer. Depending on the character of the raw coal, operation has ranged from 1.38 to 1.50 specific gravity. The float material rises to the surface at the center, and sink material is lifted by the wheel flights and discharged at the top of the vessel. Two medium currents are present in the washer. One enters through the bottom diffuser area, releasing entrapped float material, and the other enters from one side near the surface, pushing the float coal from the unit via an overflow weir. The bottom current is the major part of the flow. It causes the effective specific gravity of separation to be approximately .05 units higher than the gravity of the medium. After having washed 1,801,405 tons of raw coal, the rotor and housing were well worn due to normal wear plus unknowing abuse during early operation of the plant. Tramp steel (principally spikes, bolts, and cutting bits) caused the most serious damage. These became wedged between the rotor flights and outer shell, and damaged the washer. A new washer will have a much longer life, since tramp steel has been eliminated from the washing circuit.

Realizing the ineffectiveness of the 72-in. chute magnet, it was removed suspended above the belt conveyor preceeding the pre-wet screen. This, though not orthodox, proved very effective and eliminated tramp steel damage to the washer.

When the washing plant was started up in September 1949, the carry-over of entrapped material to the reject side of the washing unit presented a serious problem. The flights would tend to pump; that is, the flight perforations would plug, and both material and medium would be lifted and discharged into the reject sluice. Such pumping would immediately lower the circuit specific gravity and reduce washing efficiency. After considerable experimentation, it was realized that much of the trouble come from improper pre-sizing. With more intensive inspection of the pre-sizing and pre-wet screens and subsequent installation of wedge

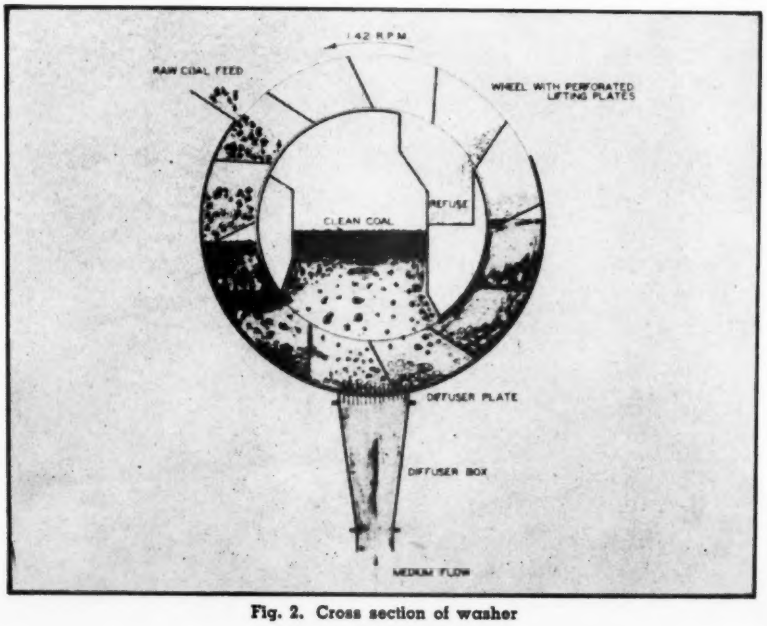
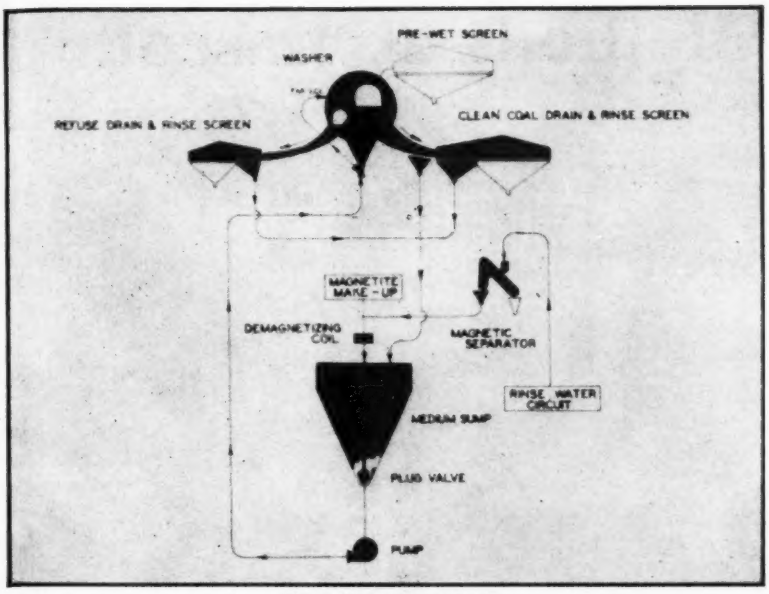


Fig. 2. Cross section of washer



Magnetite medium circuit

wire, the difficulty has been practically eliminated. Minor modification of the drainage holes in the lifter flights was beneficial. Present holes are ¾ by 2-in., arranged vertically, and constitute 23 percent of the area of the lifting flight.

The original refuse discharge from the vessel, because of surges, placed a sudden periodic load on the refuse drain-rinse screen, causing screen damage and preventing satisfactory draining and rinsing. One-half of the discharge lip was increased in height, permitting a staggered discharge from the flights to the refuse chute. This reduced the surge loading of the refuse drain-rinse screen.

Washed Coal and Other Coal Products Handling

The washed coal is sluiced to a 6 by 16-ft horizontal single-deck vibrating screen, having an amplitude of 7/16-in. and 940 rpm speed. The unit is suspended and driven by a 10 hp, 1750 rpm motor through V-belt drive. The screen was originally equipped with .080-in. diam stainless steel wire cloth of .047 by ½-in. opening and with the long dimension of the slot parallel to the length of the screen. This cloth was protected at the feed end by a section of spring steel wire cloth, having ¾ by 9-in. opening and ¼-in. diam spring steel wire. The remaining two sections of protective cloth had one by 9-in. openings and ¼-in. diam spring steel wire. In all sections the long dimension of the protective cloth opening is parallel to the length of the screen.

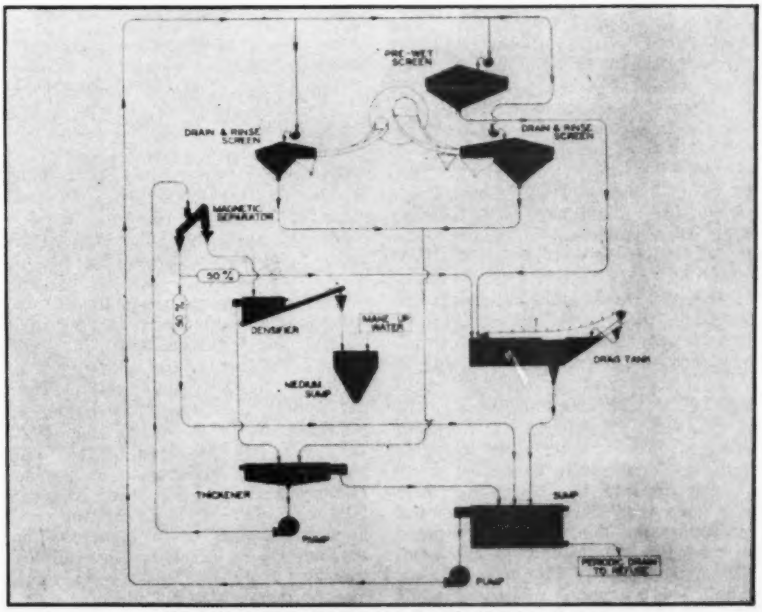
The sizing cloth, as equipped, gave very poor service. After a very short life, the cloth broke along the backup bars, while showing no sign of wear. Various ideas to solve this difficulty were tried. Finally the long dimension of the slot was turned parallel to the width of the screen. This immediately eliminated the breaking and prolonged the life from 1000 hr to 1500 hr. Draining and rinsing were also improved.

During April 1951, stainless steel round wire screens were tested in an attempt to obtain longer life and improve draining and rinsing. The deck consisted of four 71-in. by 48-in. long sections. The wires were welded to ½-in. cross rods, three in. apart. The first or feed section, had a clear opening of 1½ mm., the second section one mm., and the third and fourth sections ½-mm. openings. Two straps ½ in. by 2 in. high were placed across each section to retard the flow.

In spite of the straps and other means of retarding the flow of coal, the material traveled at an excessive rate across the screen deck. Water and magnetite were carried over and lost from the medium circuit. The 1½-mm. opening in the first section permitted too coarse material to pass through, returning contaminating fines to the medium circuit plugging the diffuser plates in the washer. This required complete plant stoppage about five times per shift so the medium circuit could be back-flushed to clean the diffuser plate. Reduction of the 1½-mm. opening might have prevented this; however, it would only have added to the carry-over and magnetite loss. The combined poor screening and loss of magnetite and water from the system caused erratic washing. After 57 hr of operation, 8707 tons of coal having passed over the screen, the first section began to show signs of wear. Observing this and the unsatisfactory results being obtained, the screens were removed and replaced with the original cloth.

Originally 11 sq ft of 1½-mm. aperture wedge wire was used in the sluice leading to the clean coal drain-and-rinse screen. This has been reduced to 7.81 sq ft of one-mm. aperture. The majority of the medium is drained off through this area. The flume extending from the washer to the drain-and-rinse screen is approximately 12 ft long and makes a right

(Continued on page 66)



Magnetite reclamation and water clarification circuits

Drilling Methods at Mascot

Airleg has definite advantage in selective mining

Airleg Drills Compared With Other Types to Determine Best Applications of Each

By HARRY L. MILLER

Assistant Superintendent of Mines
American Zinc Co. of Tennessee

IT is proposed here to describe the testing and adoption of airleg drilling to replace column mounted drills, and to compare airleg drilling with jumbo drilling in the mines of the American Zinc Co. of Tennessee.

Most of this airleg testing was done in the No. Two Mine, Mascot, Tenn. All data refer to the No. Two Mine, unless otherwise stated. The No. Two Mine ore is in the Kingsport Formation of the Knox dolomite. This formation, as far as the drilling is concerned, is composed of dense, fine-grained dolomites with occasional chert nodules and some silicification. This ground is considered very good for ordinary percussion drilling because bit wear is not excessive and fitchery ground is seldom encountered, except in the very shallow workings. Penetration rates are lower than rock hardness would indicate, but this is largely accounted for by the grain size of the dolomite and the absence of extensive fracturing. Drilling in this ground produces smaller cuttings than would normally be expected.

Prior to late 1952, stope drilling was done with 2¾-in. shell mounted jackhammers. This machine was used on the conventional column and arm. The drill steel was 1¼-in. round, lug shank, using a popular brand threaded, multi-use steel bit. The starter bit gauge was 2⅛-in. One man, without a helper, operated each drill. Also in use at this time were three rubber-tired jumbos mounting one or two machines of three or 3½-in. bore.

These machines were used in the breaking of ore in our heading and bench system of open stoping. The beds have an average dip of about 20 degrees. The average ore thickness as mined is about 18 ft. The orebodies vary over a wide range in respect to regularity and lateral extent.

During 1951, with column mounted machines, the average feet of hole drilled per machine man shift was 42.11. This resulted in breaking 39.85 tons per machine man shift. With airleg drilling, these figures have been raised to 89.80 ft of hole and 67.38 tons per machine man shift. This represents an increase of 69 percent in tons broken per machine man shift. The machine men do all routine work such as taking down loose ground, setting up, drilling, transporting explosives from haulageway to stope, and blasting their rounds.

As the result of observations by management during 1951 of benefits gained by the use of airlegs in Canada, it was decided to begin experiments with this new scheme of drilling. The early attempts at airleg drilling were not encouraging for several reasons. Most important of these was the lack of a skilled demonstrator and the improper combinations of equipment. The experiments were discontinued after a few months.

Renew Tests

Early in 1952, it was decided to renew this program with some change in equipment. The 2⅝-in., 45-lb jackhammer, used in some of the early trials was refitted with a ⅞ by 4¼-in. hex chuck. Several pieces of alloy steel with integral, tungsten carbide, chisel bits were purchased. The airleg used in the earlier experiments was used without alterations. This combination, along with a demonstrator experienced in airleg drilling, shortly proved that this method could lower drilling cost at Mascot. The airleg almost eliminated set-up time and the smaller bit gauge gave a much higher penetration rate.

During the remainder of the year, the experiments were expanded to include the testing of several machines in the 45-lb class. These tests were conducted in order to determine the

most desirable machines and legs for our conditions. Machines were judged on penetration rate, maintenance, flexibility, ease of handling, hole cleaning, effect on steel and insert, and over-all weight. It is difficult to say that one point is more important than another. The initial capital costs do not vary considerably. The preference as to length of leg or type of machine will vary among individual machine men. The miners usually prefer the lighter weight machine.

Even though we considered standardization an important factor, we now have machines and legs made by two different companies. We are now running an extended test on a third brand. By April 1953, we had placed a total of 63 units in operation in all of our mines. This was 90 percent of the machines employed in stope work at that time.

Achieve Miner Acceptance

Machine men and some supervisors were at first skeptical, as most miners are, of this innovation in drilling, but as the results became well known the prejudices were rapidly dropped.

Training of machine men on this equipment became a very simple task after the first few men who were trained, enthusiastically expressed their preference for airlegs over conventional drills.

We have continued to use the ⅞-in. integral steel. At first, starting gauge of 1 9/16-in. was used with a decrease of 1/32-in. for each change. There were doubts as to whether this smaller blast hole would hold sufficient explosives to break our rounds; however, only small changes were necessary in hole spacing to compensate for this 35 percent decrease in hole volume. After that had been proved, hole volume was reduced another 20 percent by using a starting gauge of 1 11/32-in. This made it necessary to change powder cartridge size from 1⅛ by 8 in. to one by 8 in. Where formerly one ton of ore was broken for each foot of hole drilled, about 0.75 tons per foot of hole are now broken, despite the 55 percent smaller blast hole. This smaller hole will break the ground with the same burden used on the large hole but a decrease in burden was necessary to get desired fragmentation without changing powder strength. Recently a change was made to ⅞ by 8-in. powder of higher volume strength to achieve even better fragmentation.

Recently testing was begun with ¾-in. hex steel with a starting bit gauge of 1 5/32 in. This steel will drill a hole with only 33 percent of the volume of the hole drilled with the 2⅛-in. starting bit formerly used. Advantages gained with this smaller steel are: another 30 percent increase in drilling speed, lower first cost in drill steel, a possible saving in explosives and a further saving in compressed air. For this size hole the ⅞ by 8-in powder mentioned above is used. The ¾-in. steel is being tested in both the 2½ and 2 15/16-in. machines.

Results Encouraging

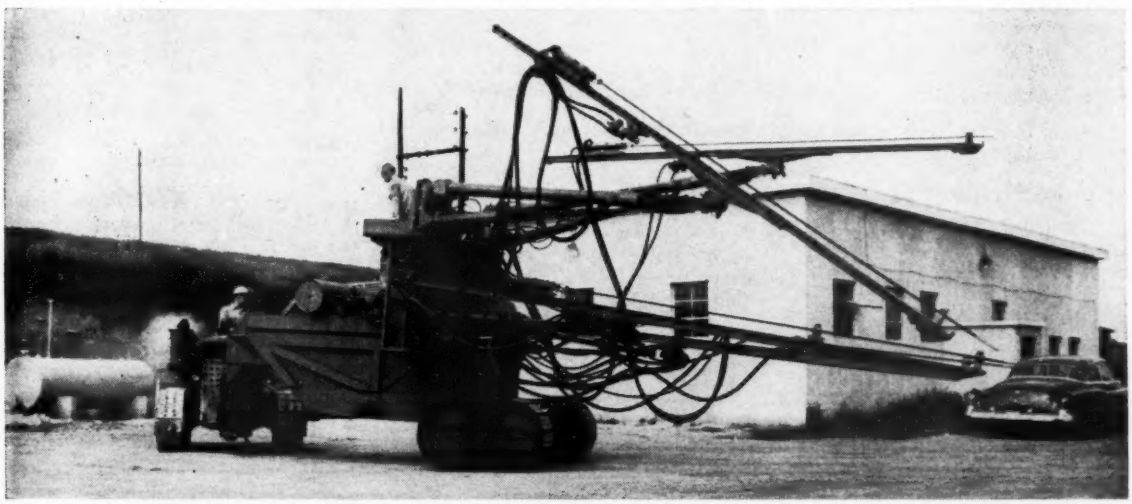
At this point the results are encouraging and we will gradually expand the use of ¾-in. steel. From tests it has been learned that the indicated life of the ¾-in. steel is slightly less than the ⅞-in. It has been impossible to determine the exact difference, due to the lack of tools to reshank the ¾-in. steel. The insert failure in ¾-in. is evidently less than in ⅞-in. steel, but shank and rod failure is somewhat greater in ¾-in. steel. We have tried several 35-lb machines with the ¾-in. steel but their use was discontinued after determining that the gain realized from the lesser weight of the 35-lb machines would not nearly compensate for the big drop in penetration rate. It was quite evident that the light machines would give a very long life to the steel. There is no noticeable increase in wear on the striking surface of the piston when using ¾-in. steel.

As might be expected, the cleaning of this small hole presents a new problem. The inferior blowing of our larger machine prevents its use except in the places where fitchery ground is not likely to be encountered. It is difficult to accurately ascertain figures to compare the burden on the ¾-in. holes with the 0.75 tons per foot of hole on the ⅞-in. steel. Visually, there appears to be no difference. Likewise, the difference in fragmentation can only be stated as an estimate made from observation. Evidently the ¾-in. steel will give equal, if not better fragmentation, than ⅞-in. steel.

The ¾-in. steel is very desirable from a handling standpoint. The worn out rods also make good scaling and chute bars. There is a small saving too in grinding wheels used to regrind the inserts.

Adoption of airlegs has not made any changes necessary in mining method. On the contrary, they have made possible some very desirable improvements in practices and routine.

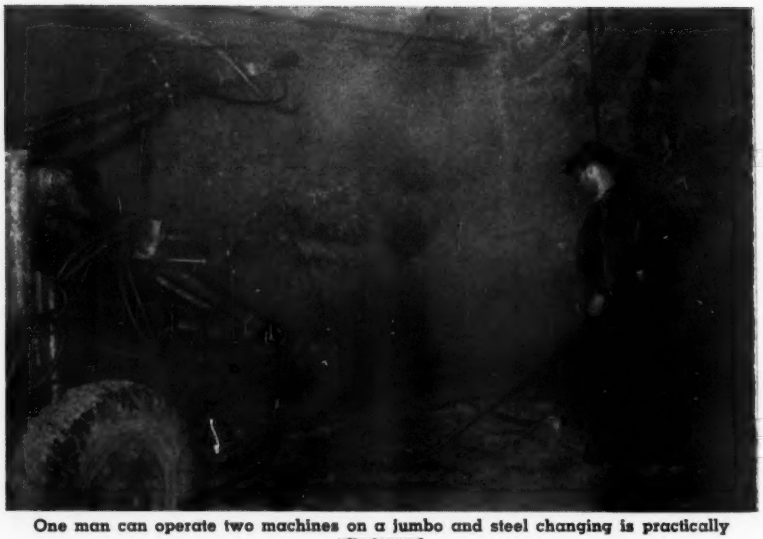
During the transition period, there was some concern about a possible increase in injuries to machine men. As is true with the introduction of any new mechanical equipment, the operators must be educated to avoid the new hazards. However, airlegs have not caused any increase in accident rate.



Four hydraulic booms on "Gismo" makes it a heavy jumbo, mounting three-in. machines on 17-ft sashes

Airlegs A Flexible Tool

Flexibility of the airlegs make them very useful for many miscellaneous jobs, such as test holes, blockholing, roof bolts, pipe hangers and eye bolt holes.



One man can operate two machines on a jumbo and steel changing is practically eliminated

Use of airlegs has enabled us to make a substantial reduction in our total mining costs. At the same time, contractor miners have increased their pay in spite of some reduction in hourly wage. The miners are well pleased with this fast, lightweight equipment. Daily production from No. Two Mine has been increased by almost 250 tpd even though the payroll has been reduced by 33 men.

Data in the following tables show only the direct savings resulting from adoption of airleg drilling. The use of airlegs has facilitated sizeable cost reductions in other items as slushing, loading and general overhead.

Jumbo Drilling in Drifts

Airlegs have been successful in driving 9 by 9-ft drifts. But they are used only for off-the-track drifting because track-mounted drift jumbos are already available.

In drifting, three and 3½-in. machines on hydraulic track-mounted jumbos have been used for several years. The practice is for two men to make a round in and out on a one-shift basis. It was desired to replace the 1¼-in. carbon steel and 1⅝-in. four-point carbide detachable bit with the steel used in stope airlegs for the following reasons: cut drill steel and bit cost; cut inventory and types of steel; speed up heading advance; cut compressed air cost; all of which will give a reduction in development cost.

The first point to be determined before making this change was the life of the ⅞-in. steel in the heavy three-in. machines. As expected, the ⅞-in. steel did not hold up as well in the three-in. machines as in the 45-lb airleg mounted machines. The ⅞-in. steel was not tried in 3½-in. machines. It was soon evident that increasing the rotation speed of these three-in. machines increased the life of the steel and inserts to a point where it was competitive with the heavier section formerly used.

The small hole made it necessary to change our standard drift drill pattern in order to pull the usual five- to six-ft rounds. After this was worked out, sashes were lengthened to handle a 10-ft, 6-in. length steel. This allows drilling an eight-ft round without disengaging the centralizer.

This work has not yet progressed enough to give comprehensive figures on improvements. We are definitely making improvement in our advance rate and soon we expect to be averaging from 7½ to 8 ft of advance per shift. We have definitely proved that the small holes, using a burn cut, will pull at least ten ft per round. It has been necessary to add at least 10 holes to the former pattern in order to pull this ten ft. It now appears that eight ft in the 9 by 9-ft heading with 30 holes is possible. This can be done without increasing the powder consumption of 15 lbs per foot of drift.

Work at North Friends Sta.

Many changes have been made in drilling practices at North Friends Station Mine in order to obtain a minimum ore breaking cost. At this property, which started production in March 1952, self-propelled, rubber-tired jumbos are used as the principal drill mount. These jumbos mount two three-in. machines on hydraulic booms.

At first, one-in. hex carbon steel with a 1⅝-in. tungsten carbide chisel bit was used. This steel was made up in the blacksmith shop. Two men were used on each jumbo, that is, one man per drill. The first drilling was done with sashes long enough to handle eight-ft long drill steel. The sashes were soon lengthened to handle 12-ft steel, to avoid changing steel and thereby increase footage. The next step taken to increase the feet of hole drilled per machine-man shift, was to use only one man to each jumbo. This improved the footage in the order of, from 130 to 200 ft per machine man shift.

Adapt Gismo

Just recently we have mounted four hydraulic booms on a "Gismo," making a large heavy drill jumbo. This jumbo mounts four three-in. machines on 17-ft sashes, handling 15-ft steel to drill 14-ft holes without changing steel. Two men operate the four machines. These machines use ⅞-in. alloy steel, with tungsten carbide chisel bit, 1⅝-in. gauge in the cut and 1$\frac{5}{32}$-in. gauge in the remainder of the holes. Penetration rates run as high as 36 in. per minute on the smaller bit.

This jumbo has not been in service long enough to determine its full potential, but we know we can average more than 400 ft of hole per machine-man shift, excluding work required to charge the resulting holes with explosives, but including time to scale the back and set-up time. We expect to reduce the costs shown in the tables below.

In comparing the advantages and disadvantages of the airlegs versus jumbos, one must always consider the physical conditions under which they are used and limits of adaptability of each to the given conditions. Column-mounted machine, for our use, will not compete against either the jumbo or the airleg.

No Hard and Fast Rules

There are no hard and fast rules governing the choice of equipment to be used in future operations. However, experience has taught the limitations for each type. As in the past, continuous testing may alter some criteria, and the company definitely will continue to experiment and strive for improvement in results with both types of drilling equipment.

For mining here, in general, it can be said that for large, thick and relatively uniform orebodies, the jumbo will give the lowest cost. The airleg is more suited for irregular, thin orebodies. Naturally, the airleg can be transported into and out of small isolated orebodies much more cheaply than a large heavy jumbo. Another point which governs selection is the dip of the ore. No sharp line can be drawn to say at what dip the jumbo must give way to airleg but in most cases anything over 15° dip can best be broken with airlegs. This would not necessarily apply to thick uniform ore shoots.

Main advantage of the jumbo is the fact that one man can operate two drills, and steel changing can be essentially eliminated. To be effective, the jumbo must have one large face or perhaps several small faces available to it each shift. This require-

ment eliminates thin, narrow, erratic ore shoots from jumbo drilling. Jumbos also require a relatively smooth stope floor to move in and out without undue delay. This is sometimes hard to meet when the broken ore is moved to the loading point by slushing. It is easily met when the broken ore is handled by diesel loading equipment such as the Gismo. The jumbo is sometimes difficult to adapt to old, existing mines but can more easily be fitted into new, highly mechanized, trackless mining.

Airleg in Selective Mining

The airleg does have a definite advantage in selective mining. It offers the flexibility needed to mine on a sharp selection between ore and waste in erratic orebodies. It can be moved rapidly any place a man can walk or climb. Other outstanding advantages of the airleg are its low capital cost and low, simple maintenance. Roughly, four airlegs can be purchased for one-eighth of the cost of a four-machine jumbo. The maintenance cost per foot of hole is less for the airleg. We have not yet determined the life of each type of equipment but it is safe to say the jumbo will last longer.

In the final analysis one must select the piece of equipment which promises to give the lowest cost per ton of metal produced after considering all charges. As far as can be seen American Zinc will continue to use both types of equipment. The physical conditions of the stope will continue to govern the selection of the drilling equipment.

Unnecessary handling and nipping which could damage steel and inserts is avoided. Each machine man is allowed to keep at least two sets of steel in his stope. He must return the steel to the underground shop only when a failure occurs. To sharpen dull inserts, a bit grinder carries a small, lightweight, portable pneumatic grinder to the working face on a regular weekly schedule. Supervisors make a monthly inventory to determine whether or not steel is being carelessly lost. This system is satisfactory in that handling is cut to a minimum, the miners are adequately supplied and grinding is done by a trained and skilled man. Sloppiness on any one of these points with this expensive steel can easily run steel cost out of line. The average life of the steel is about 900 ft. Regrinding is necessary, depending on the abrasiveness of the ground, after each 30 to 150 ft of drilling.

The regular blacksmith has learned to do a fair job on reshanking this alloy steel without use of any special equipment. But a shop is being equipped to handle alloy steel and to set carbide inserts.

Testing Coupled Steel

Early in 1953, testing was started of the extension, or coupled, steel for long-hole drilling. The 2 15/16-in. machine is used with this ⅞-in. hex steel, joined in five-ft lengths with a thin, rope thread, alloy coupling. A 1 9/16-in. chisel bit is used. Shank pieces and extension rods are available in several lengths. Use of this long-hole drilling is limited to underground prospecting and pilot hole drilling. This machine is hand-held in drilling vertical down holes, mounted on a regular leg for flat holes or mounted on a raising feed for drilling vertically up. This type of prospecting, even though limited to about 50 ft vertically up or down and to 130 ft horizontally, has proved to be satisfactory and much cheaper than diamond drilling within the above limits. Improvements in both methods and equipment will reduce present costs. The development of new machines designed especially for long-hole drilling is being watched.

PERFORMANCE DATA

Type Drilling Equipment	*Holes/ Shift*	*Feet/ Shift*	*Tons/ Mach. Shift*	*Lbs Powder /Ton*
Column-Mounted, 6 mos. '52	4.76	44.08	46.94	0.38
Airlegs, 5 mos. '53	8.50	78.91	61.79	0.37
Airlegs, 12 mos. '53 and '54	9.68	89.80	67.38	0.36
Jumbos, North Friends Station Mine, 12 mos. '53 and '54	16.75	146.96	97.75	0.78

COST PER TON OF ORE

Type Drilling Equipment	*Drilling Labor*	*Integral Steel*	*Powder Cost*	*Comp. Air*
Column-Mounted, 6 mos. '52	$0.337	$0.040	$0.059	$0.047
Airlegs, 5 mos. '53	0.277	0.032	0.063	0.036
Airlegs, 12 mos. '53 and '54	0.255	0.034	0.064	0.035
Jumbos, North Friends Station Mine, 12 mos. '53 and '54	0.182	0.054	0.139	0.020

COMPARISON OF MACHINES

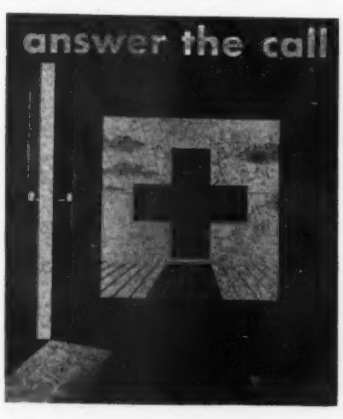
Machine	*Piston Diameter*	*Approx. Wt. Lbs*	*Bit Diameter*	*Air Pressure*	*Penetration Inches/Min.*
Column-Mounted	2¾	65	1⅞	85	7
A	2⅝	48	1 9/16	80	7½
B *	2½	47	1 9/16	85	12
B	2½	47	1 11/32	85	15
B	2½	47	1 5/32	85	20
C	2½	46	1 9/16	85	14
C	2½	46	1 11/32	80	15
C1	2½	44	1⅞	80	15
D	2 9/16	53	1 9/16	80	11
E	2 9/16	50	1 9/16	80	14
E	2 9/16	50	1 11/32	80	16
F *	2 15/16	53	1 9/16	80	16
F	2 15/16	53	1 11/32	80	19
F	2 15/16	53	1 5/32	80	24
G	2⅝	52	1 9/16	85	18
H (Jumbo)	3"	80	1 5/32	85	32

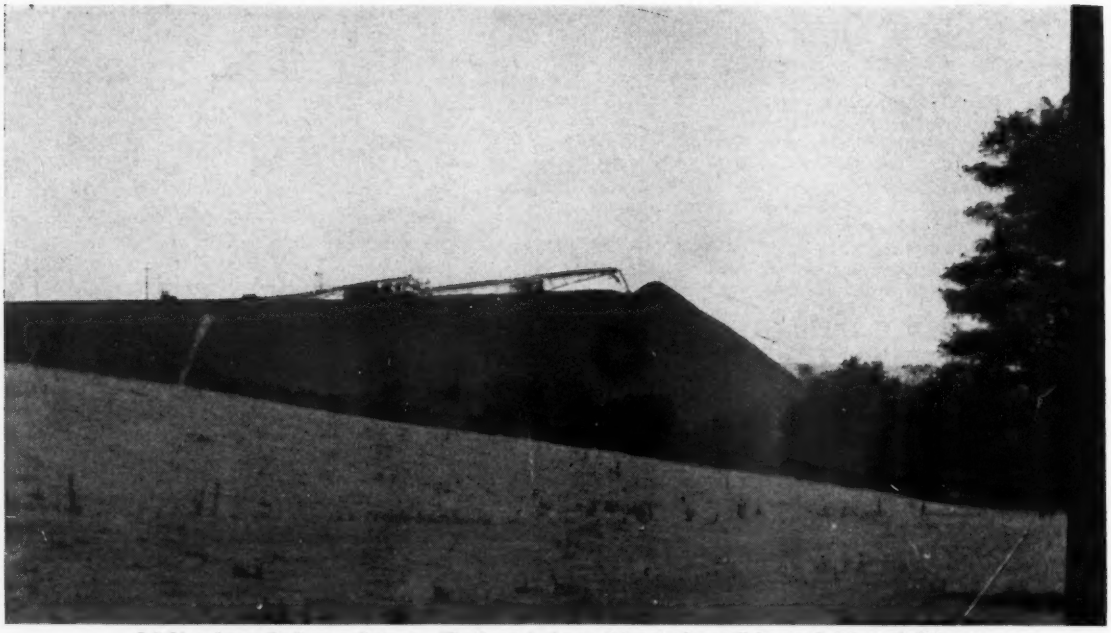
* Types purchased.

A Look Ahead

Since it is our conviction that it will be necessary to make more improvements in efficiency to meet higher wages and lower market prices for our products, we will continue to test new and improved equipment. We know that figures which look good today may not meet tomorrow's demands. Although we have more than doubled our drilling speed, we are looking for means of drilling tomorrow's holes at an even higher rate of speed.

We hope that the steel and machine manufacturers will be able to furnish us with means of drilling holes of about ¾-in. diam at the rate of above 36-in. pm. The explosives people will be called upon to furnish a charge for these small holes that will break the ground without materially decreasing the burden per hole.





J & L's refuse pile from a distance. The heap in front of the stacker will be graded by a bulldozer

Refuse Disposal at J & L's Central Cleaning Plant

Pennsylvania Coal Operator Handling 150,000 Tons of Refuse per Month at a Direct Cost of Two Cents per Ton

By GEORGE W. SALL

HOW do you get rid of an estimated 38,000,000 tons of refuse over a 35-year cleaning plant life? This is the problem that faced the men who operate the coal mines for Jones & Laughlin Steel Corp. when it was decided late in 1946 to build a central cleaning plant at La Belle, Pa. Introduction of mechanical loading by the company and the full seam mining which accompanied this move made construction of a new plant attractive. The plant was to be large enough to handle the production from the company's Vesta No. 4 and Vesta No. 5 mines, both operating in the Pittsburgh seam. These are large mines. They have a total capacity of about 18,000 tpd.

It was calculated that over the life of the property some 38,000,000 tons of refuse would have to be disposed of. That is a lot of refuse. It would make a pile roughly one mile long, 1000 ft wide and 200 ft high—or the equivalent of a little more than 12 times the volume of the great pyramid of Egypt. The plant site selected was right on the Monongahela River and there was no disposal space in the immediate neighborhood. The area finally selected was a mile away and 247 ft above the cleaning plant.

Several Methods Studied

After the disposal area had been picked an engineering study was made to determine the most economical means of transporting refuse from the plant to the gob pile. Several methods were considered. Among them were trucking from storage bins at the plant; trucking from the end of permanent conveyors; aerial trams; and a system of permanent and temporary conveyors to a stacking conveyor. The latter method proved to be the most economical for the particular set of conditions according to the completed studies.

The next step was to design the system. Jeffrey Manufacturing Co. in cooperation with J & L installation personnel designed the installation for a capacity of 750 tph. It was decided to use two permanent and one semi-permanent conveyor along with a stacker and its trailing conveyor. The permanent conveyors were to carry refuse to the edge of the disposal area in two lifts. From there, the refuse was to be carried out on the gob pile itself by the semi-permanent conveyor to a portable conveyor and then to the stacker which would deposit the material in a predetermined pattern.

Operation of the system has been successful. By September 1, 1954, approximately 7,000,000 tons of refuse had been handled and the gob pile continues to grow at the rate of about 150,000 tons per month.

All Reject Plus 1.55 Sp Gr

To best describe the operations of the system, a quick trip through the cleaning plant is indicated. Basically, it is a Heavy-Media process plant. Raw coal from the two Vesta mines is crushed to an eight-in. top size. This is then separated into two sizes— 8 by ⅜ in. and minus ⅜ in. Both fractions are cleaned at 1.55 sp gr. The sink material from each of these sizes goes out as refuse. Later the 8 by ⅜-in. float is separated at 1.35 sp gr, with the float being shipped as metallurgical coal and the sink as steam coal.

Reject from the primary circuit, the 8 by ⅜-in. sink at 1.55 sp gr, is dewatered on Allis-Chalmers Low-Head vibrating screens and conveyed directly to one of two refuse bins. Reject from the small size goes through a drag tank and then over ½-mm wedge wire screens for dewatering. From here it joins the larger size refuse on its way to storage.

The two refuse storage bins each have a 1200-ton capacity and give surge capacity between the cleaning plant proper and the refuse disposal system. Incidentally, these bins supply the only surge capacity in the plant. The plant can operate for about two hours before the bins are filled and the disposal system has to be put into operation. This permits short shut downs of the refuse disposal system for minor maintenance and also allows a shut down for the lunch period.

Can Crush for Compaction

Refuse is fed from the bottom of either of the bins by a vibrating feeder to a 48-in. feeder belt. Top size of the refuse at this point is eight in. Total moisture is between seven and eight percent.

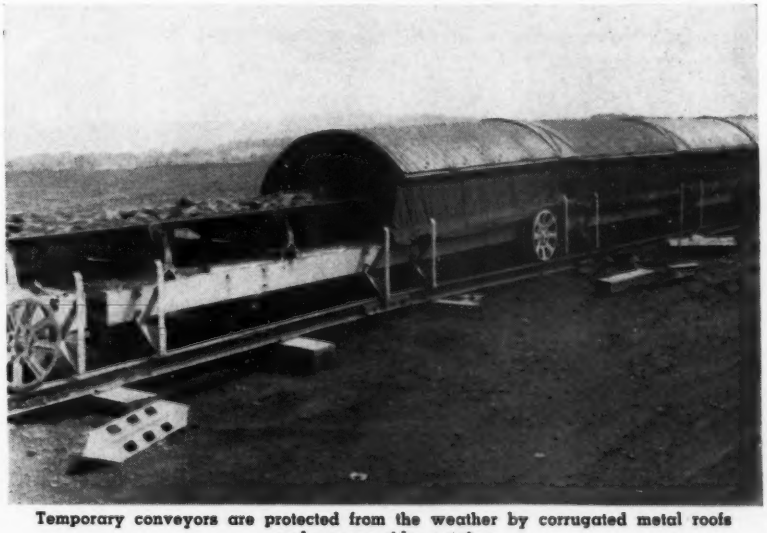
From the feeder belt, refuse drops into a single roll McLanahan & Stone crusher. Originally it was thought that refuse might have to be crushed to allow for maximum compaction to prevent firing of the refuse pile. The reject runs between 85 and 88 percent incombustible material. Company engineers felt, however, that because of the high ash nature of the refuse and its low sulphur content that fire in the gob pile could be prevented with proper compaction. So far crushing has not been necessary, but if the gob does begin to heat, finer crushing for better compaction may be needed. The crusher is capable of reducing the refuse to a three-in. top size but is now backed off to a five-in. opening.

Conveying System

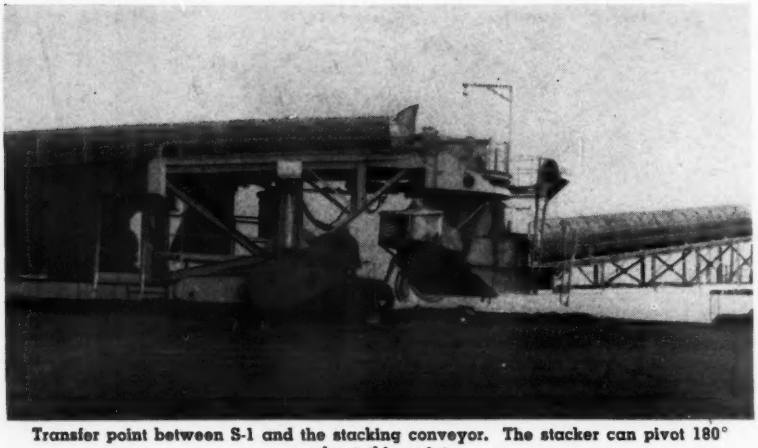
After going through the crusher, refuse drops directly onto a 36-in. belt. This carries the material 1100 ft up the hill where it is transferred to the second permanent belt for a 1290-ft

The two circular refuse storage bins furnish 1200 tons of surge capacity to the cleaning plant

Two permanent conveyors, in steam heated galleries, carry refuse from the plant to the edge of the disposal area, 3300 ft away and 247 ft above the plant



Temporary conveyors are protected from the weather by corrugated metal roofs and canvas side curtains



Transfer point between S-1 and the stacking conveyor. The stacker can pivot 180° about this point

At the transfer point from D-1 to S-1, the S-1 belt is picked up to be loaded over impact idlers. The two chutes on the left catch belt cleanings from D-1 and deposit them on S-1

Discharge end of the stacker. Note the rail in the foreground. It is part of the track put down for S-1 to run on

ride the rest of the way up the hill to the edge of the disposal area. These conveyors are known as M-1 and M-2 respectively. The belts are 6-ply 42-oz duck and operate at 450 fpm.

Both M-1 and M-2 are enclosed in a gallery, which is steam heated during cold weather.

At the top of the hill, refuse is transferred from M-2 to a semi-permanent conveyor, which is given the code name D-1. It is constructed from portable conveyor equipment and can be made as long as 1200 ft.

From D-1, refuse is transferred to the belt serving the stacker, better known as S-1. It is also a semi-portable conveyor. S-1 conveyor sections are fabricated in 20-ft sections and mounted on mine car wheels—one pair per section. Track mounted, S-1 is pulled forward by the stacker as it advances, sections being added to S-1 behind the transfer point from D-1 as needed. Track is added at the stacker end as the stacker advances.

To prevent excessive belt wear on S-1, a unique loading arrangement has been made at the transfer point from D-1 to S-1. Since S-1 advances as the stacker moves forward, at one time or another the conveyor is loaded at every point along its entire length. Belt idlers on S-1 are spaced every four ft, not an ideal situation for belt loading. To alleviate this problem, a permanent loading station has been constructed. It is a simple framework which straddles S-1 and is equipped with a set of impact idlers a foot or so above S-1. The belt is threaded over the impact idlers. In operation the belt is picked off the idlers of S-1 and loaded over the impact idlers and then back to S-1 and on its way to the stacker. In this way the belt is always loaded over impact idlers and belt life is prolonged.

Stacker Can Reach 171 Ft

At the pivot point on the stacking conveyor, refuse is transferred to S-2, the stacking conveyor itself. This conveyor is mounted on a trestle-like frame which in turn is, about half way out, mounted on a pair of crawlers. Pivoted at one end, the stacking conveyor can be swung around through an arc of 180°, 90° right and left from the centerline of S-1. From the pivot point to the discharge end of the stacker is a horizontal distance of 171 ft. The vertical lift is 31 ft 7-in. Counting the trajectory of the refuse as it comes off the belt, the stacker can make a pile 370 ft wide.

A bulldozer is used to level and pack the refuse as it is deposited by the stacker. Actually the material is heavy enough to be pretty much self-packing and the primary work of the dozer is grading.

Refuse is being deposited according to a predetermined and engineered plan. The stacker operates along definite coordinates of a grid system. In

Another view of the loading station at the D-1 to S-1 transfer. The loaded belt is fed back to the S-1 conveyor

this way the greatest possible use is being made of available area.

The company also plans to build a high gob pile. The pile is being put down in 80-ft layers, which is the upper limit for one pass. A greater thickness will cause slides that might endanger the stacker. It is possible to put down refuse in such a manner as to maintain a plus 10 percent grade. This allows the stacker a certain amount of flexibility and permits the pile to be built up as well as out.

Country side ahead of the growing refuse pile is graded with a bulldozer to remove all vegetation which might later cause a fire if covered and allowed to furnish fuel for a spontaneous combustion. Benches are also made at this time, if needed, to keep the pile from running away on reverse slopes.

Control and Maintenance

All conveyors are driven from the head end. Power is 440-V, a-c. Standardized 30-hp and 125-hp wound rotor drives are used. Belts are started with the 30-hp motors and shifted to the larger drives for load. Sequence control is built in and all belts have gravity take up and utilize spring-loaded thruster brakes to prevent belt reversing if the power should go off.

As mentioned earlier, M-1 and M-2 are enclosed in steam heated galleries. D-1 and S-1 are protected with corrugated sheet metal covers and canvas side curtains to prevent the wind from lifting the belt off the idlers and to protect the conveyors from the weather.

In the event there is a breakdown in the system, refuse can be trucked to a disposal area. Trucks can be loaded from the surge bins at the bottom of the hill or at the transfer point between M-1 and M-2.

A total of seven men are used per operating shift. The crew is made up as follows:

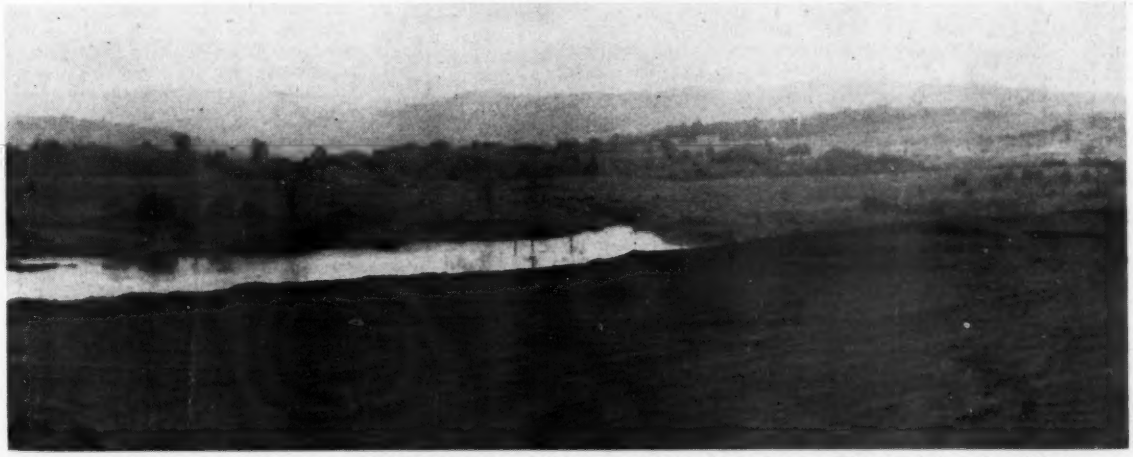
1 Stacker operator
2 Conveyormen
1 Crusher Operator
2 Repairmen
1 Bulldozer Operator

Direct cost of refuse disposal is two cents per ton of material handled including labor, maintenance and material. On a 20-year amortization basis, the total cost is eight cents per ton, including taxes.

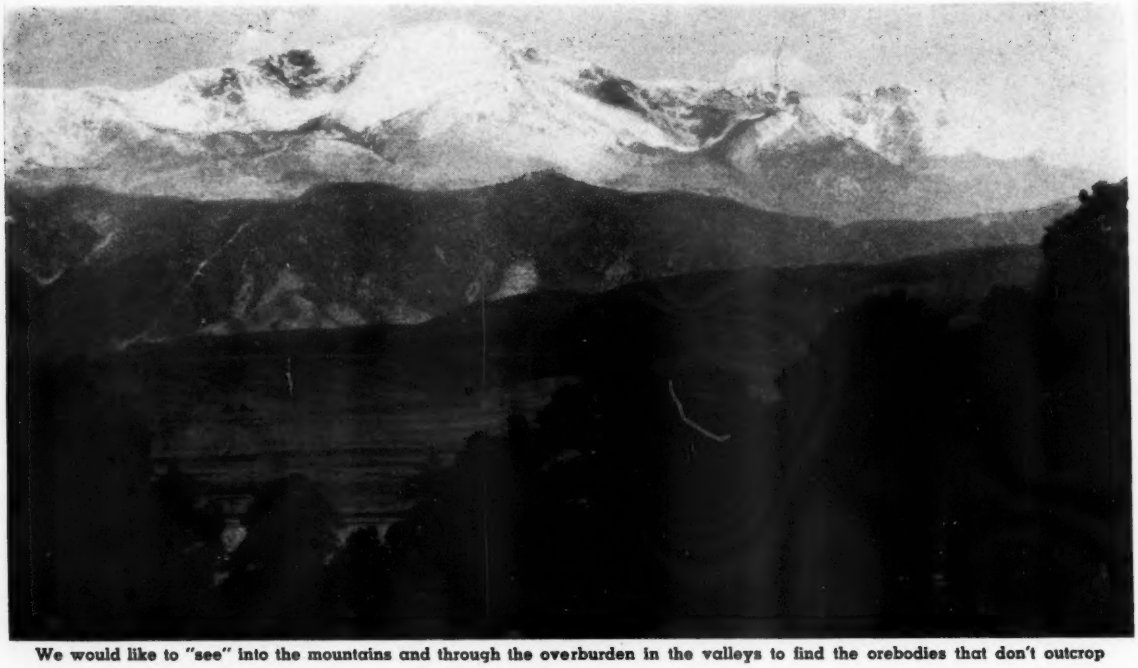
Pump Fines

In addition to the refuse that goes out on the belts, a portion of the minus 325-mesh material is bled from the cleaning plant and pumped out as refuse. There are two reasons for doing this. One, it keeps fines from building up in the water system and, two, it gets rid of a high moisture product that is difficult to dry. These fines run about 38 percent ash and amount to approximately two percent of the raw coal feed. Roughly 500 tpd of the minus 325-mesh material is pumped to the large sludge pond in the refuse disposal area. It is handled with two single stage Lawrence pumps in series. The pumps have a capacity of 500 gpm and work against a 500-ft head.

The outlet from the settling pond is a canal in which a weir has been constructed. The fine refuse, of course, settles out in the large settling area and clear water bleeds off through the canal. Samples of this effluent are taken every day to be sure that any solids it may contain are within allowable limits. The gates on the weir can be adjusted to permit a faster or slower run-off.



Slurry containing minus 325-mesh material is pumped to a large pond in the disposal area. The canal through which clear water bleeds off can be seen in the background



We would like to "see" into the mountains and through the overburden in the valleys to find the orebodies that don't outcrop

Modern Exploration Methods

Experience of Cordero Mining Co. With Several Scientific Exploration Techniques Has Been Dissappointing

By J. Eldon Gilbert
General Manager
Cordero Mining Co.

MINING is an industry that operates by exploiting a commodity which is not replaceable. When all of the commercial minerals in a given mine are removed and sold that mine is exhausted and its operation must cease. With the removal of each and every ton of ore the inevitable end of the mine becomes nearer.

To postpone this end new ore must be found by individual mines and mining companies must find and develop new orebodies.

For many years we operators have been told by "experts" that, in general, our methods of finding new ore and locating new mines are out of date. The oil companies are pointed out as examples of operators who, faced with a similar problem of replenishing depleted reserves, attack it with more energy. They rush out with the latest and most complicated scientific equipment to learn the geology of rocks, formations and structures of things they cannot see. Though their efforts have been expensive, there is no denying the fact that they have also been successful.

Many of us would also like to peer into the ground; we would like to *see* through the overburden in the valleys to the minerals which might lie hidden there. We would like to *see* into the mountains where there are ore bodies which do not outcrop on the surface. We would like to find traces leading us to outcrops that might develop into veins. How are we doing to accomplish this?

In the past most mining companies have maintained men in the field to investigate new discoveries. These men attempt to evaluate each find to ascertain its chances of becoming a mine. But these technically trained men depend almost entirely on the prospector to make the initial discoveries. This method may have been successful in the past when there were really new discoveries but at present these field men might better spend their time checking each other's notes than dashing around looking at prospects which everyone else has looked at already.

Today the virgin prospect is very scarce. The old gold hunter *looked* at most of them, even though he was unable to work some which have been worked since. He and his burro covered the country pretty well and we have had 50 or 60 years since his time to re-travel his trail and find the few he missed.

For a new prospect to be interesting now it must either contain a mineral which heretofore has not been useable or one which now demands a higher price.

As an affiliate with an oil company, we at Cordero Mining Co. are familiar with the methods used by the oil industry. Management encourages the use of any of these methods, or any other methods which might help in the search for new ore. It is intended here to discuss these tools and methods as we have used them in the field. Incidentally, Cordero's principal interests have been in mercury, antimony, tungsten, chrome and others of the minor mineral group. No effort

has been made to find copper, lead or zinc. There has been no attempt to search for large sulfide ore bodies.

From 1936 to the present the magnetometer has been used on all prospects which showed promise, and many which did not. If the original trials indicated a difference in the magnetic character of the rock a detailed survey was run. In most cases the maggie was used indirectly to locate ore. It often gave a fairly good geological picture. When this picture included faults, solution channels or key beds which were associated with ore bodies, then the maggie was most helpful to the geologist. It helped fill many details in the geological map.

The greater the geological distances between the ore bodies and the minerals which affect the magnetometer, the more interpretation is needed on magnetometer readings and these analyses and interpretations often lead to strange conclusions many of which are wrong.

Some minerals can be located directly, such as the iron ore deposits in Nevada, or the chrome bodies on the Klamath River. However, most sulphide bodies have no direct effect on the maggie and one is reduced to looking for indirect indications. For example, an important fault or vein may incidentally contain a concentration of magnetite. This would show up as a magnetic high. Perhaps the vein or fault is completely free of magnetite. It would then show up as a magnetic low.

Magnetic work can be done by two men who can make from 100 to 200 set-ups per day to cover a lineal distance of from 1000 ft to two miles. For this reason it is an inexpensive operation. Probably more of it should be done than is now being done by many companies; at least it should be tried on more properties. If anything were to show up, more detailed work could be done. If it showed nothing, the work could easily be stopped. Many companies are using the airborne magnetometer now but, so far, we have no experience with it.

Test Resistivity Methods

Cordero has also used two electrical geophysical methods. One is designed to test the electric resistance of the rock. When a current is passed through the ground from a set of batteries the ease with which it moves through the ground is measured. Various ground materials show great differences in their degree of resistance. At one operation we were interested in the size and thickness of certain chalcedony, or opalite, bodies which outcropped in places. We were able to outline them very well and to determine the distance they extended into the ground. Subsequent underground work and drilling proved the interpretation based on resistivity to be quite accurate.

On one property in Oregon we had a technical success but a practical failure. A certain zone was traced for a great distance and anomalies were discovered along this zone. While the zone was the place of mineralization and the anomalies were the areas of mineral concentrations, none of the mineralization was good enough to be ore.

On another property, a hi-grade stope was located by investigating a resistance anomaly.

At the Cordero Mine in Nevada the cinnabar mineralization is on one side of a strong fault which is covered with overburden at the surface and does not outcrop. This fault is fairly straight and nearly vertical. It has on it from two to 20 ft of fault gouge. On the mineralized side the rock is so badly altered its original identity is unknown. It was probably volcanic tuff imbedded with andesite dikes and

Modern exploration methods may turn up information on hidden deposits but the foot prospector still makes significant discoveries

hydrothermally altered. There is a large amount of pyrite and the ground water is highly acid. On the barren side of the fault the rock is andesite only slightly altered. There are no pyrites or other sulphides and the water is neutral. The problem here has been to find the extension of the fault so that it can be tested by drilling at the intersections with other structures. This seemed to be an ideal place for resistivity work but, much to our disappointment, although we have tried repeatedly we cannot trace this fault with the electrical resistivity method.

Measure Natural Potential

The other electrical method is the measurement of minute electrical currents, spontaneously generated in the ground. It is a measurement of natural potential. Some of these currents are generated by the rotating magnetic field of the earth, a large generator so to speak. Other currents are produced by chemical action of acidic solutions on some rock forming minerals, much as a battery generates electric currents. These are the ones associated with ore bodies which can be located by tracing and measuring the currents. As sulphides are acted upon by ground water and other solutions there is a great amount of chemical activity with resulting electrical currents. By tracing the paths and intensities of the currents it should be possible to locate the ore bodies.

Cordero's experience with natural potential has not been practically successful. It can measure the currents and changes of the currents can be measured. These changes can be correlated with various phenomena. They change with the season of the year, the amount of moisture in the soil, even the time of day, but so far they have not materially helped in locating ore. Even at Cordero, where there is a sharp barrier between the acid ground water in a pyrite-rich rock and neutral water in unmineralized ground, no current flow can be found to indicate the location of the barrier.

Geochemical Methods

During the past several years we have heard of geochemical methods being used to locate new ore. The literature reveals that the Russians were doing a great deal of this work in the field in the 1930s. The United States Geological Survey has developed a system of analyzing soil samples which reveals even traces of certain elements. Their tests are particularly good on copper, lead and zinc. Other mining companies are using chemical methods with success and a great deal of research is being done in the field.

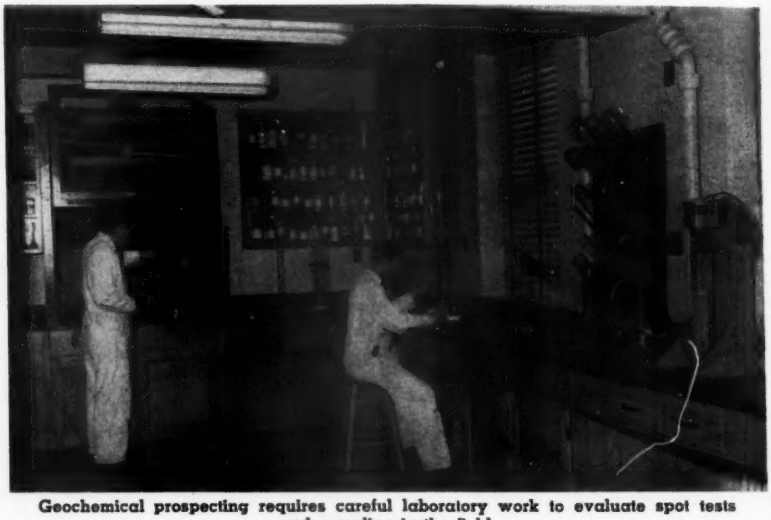
Cordero tried the general procedure as developed by the USGS. Several series of samples were taken from known ore zones. Each series was started some distance above the ore, continued through the ore zone and on below the mineralized area. We had no good tests for the minerals we were directly seeking (mercury, antimony, tungsten, etc.) but thought there might be some relationship between them and the elements we could test for copper, lead and zinc. We had no success in this and gave up this line of work after a series of samples taken over a known zinc outcrop failed to show any zinc. There must be something wrong with our chemical standards or with our technique.

Panning Up-to-Date

Several years ago S. H. Williston, vice-president, Cordero Mining Co., suggested a line of research which has been tried quite thoroughly. He suggested that pannings from streams be taken and these pannings analyzed with a spectrograph. This analysis would show if any sample contained elements in more than normal amounts. If an unusual amount of tungsten, for example, showed up we could go back to the same area, take pannings further up the stream, examine the contents, analyze them if necessary, and eventually discover the source of the tungsten. The first work was done by taking pannings from outcrops of known minerals or from the drainage of known mines. We immediately found antimony nine miles below a low grade antimony outcrop. We found tin in the tailings of a mine several miles below the mine and we understand the operators were unaware of the existence of tin. They have since put in equipment to recover the tin. Other known deposits threw a good trace and we were able to locate the source.

The next step was to move to the unknown. Because of the large amounts of old workings here in California pannings often led to old forgotten diggings. The research value of the work was difficult to assess. None of the findings were interesting commercially. We then started to work in Nevada. Here we found a range of mountains which had produced gold, tungsten, silver and minor amounts of other minerals. The drainage was simple with many short streams flowing directly down the sides of the mountains. Every stream and creek was panned, whether it was flowing or dry, and the pannings were analyzed. The results were very disappointing. Very few samples were interesting enough to check a second time and none good enough for a third check.

Later other locations were tried with about the same result. Although hundreds of samples from many localities have been taken, the results are discouraging. This method looked so good in theory but has proved disappointing in the field.



Geochemical prospecting requires careful laboratory work to evaluate spot tests and sampling in the field

In Summary

Of the five methods discussed, use of the magnetometer, measurement of electric resistance, electrical natural potential, chemical soil analysis, and spectrographic analysis of pannings. Cordero has had moderate success with the first two and only very limited success with the last three.

There are many other methods and tools not discussed because of limited experience with them in the field. However, based on the experience our company has had, a good field man equipped with nothing more than a miner's pan, a prospector's pick and good transportation (which occasionally is still a burro) can still compete in this business of finding mines.

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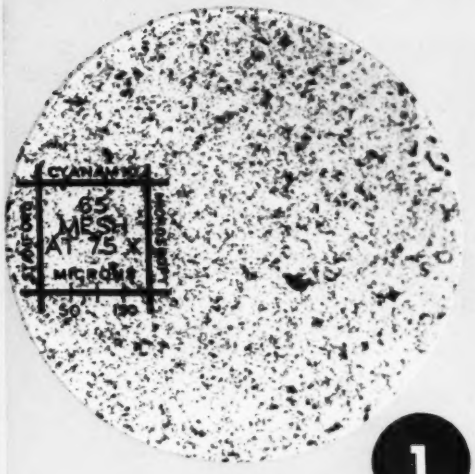

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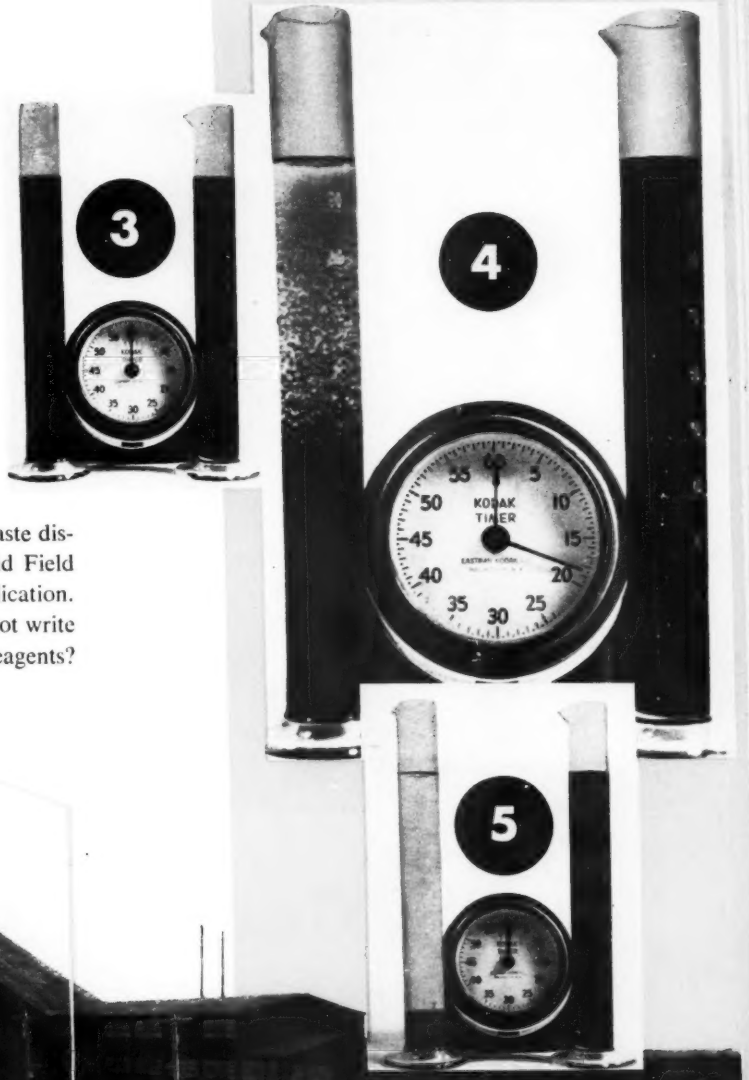

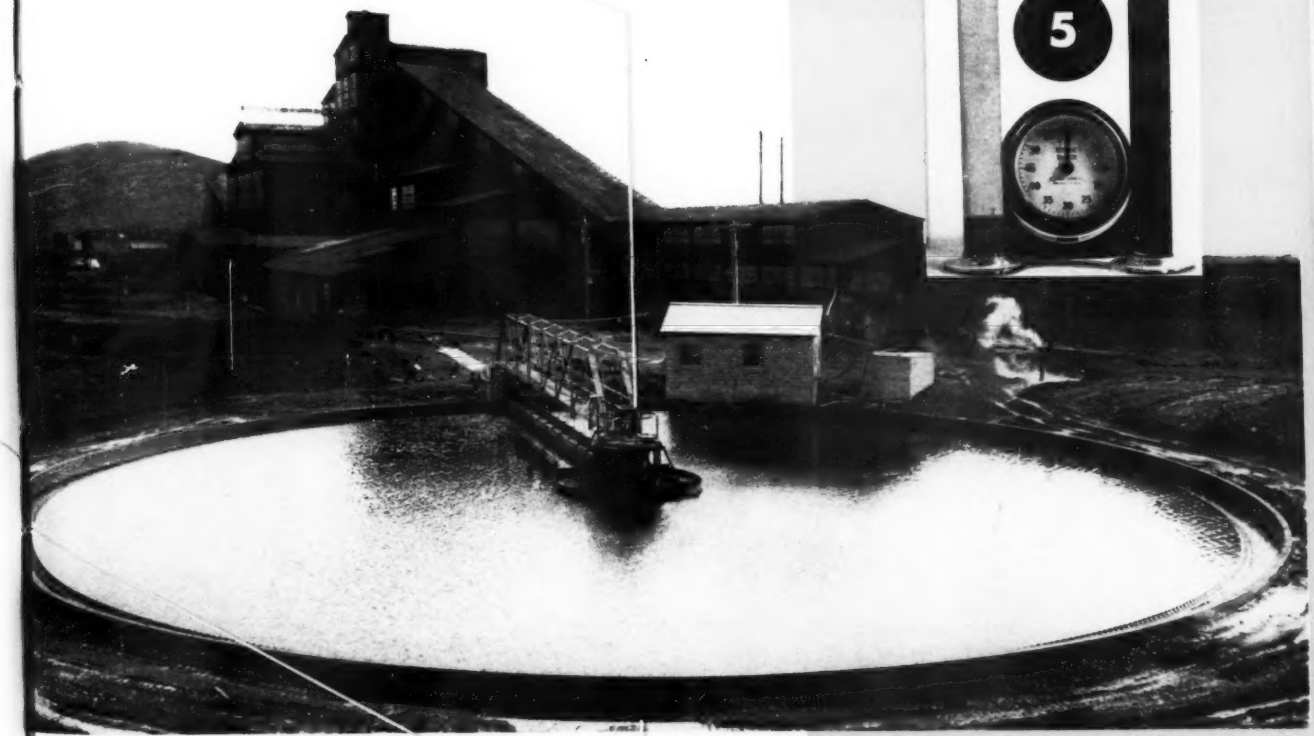

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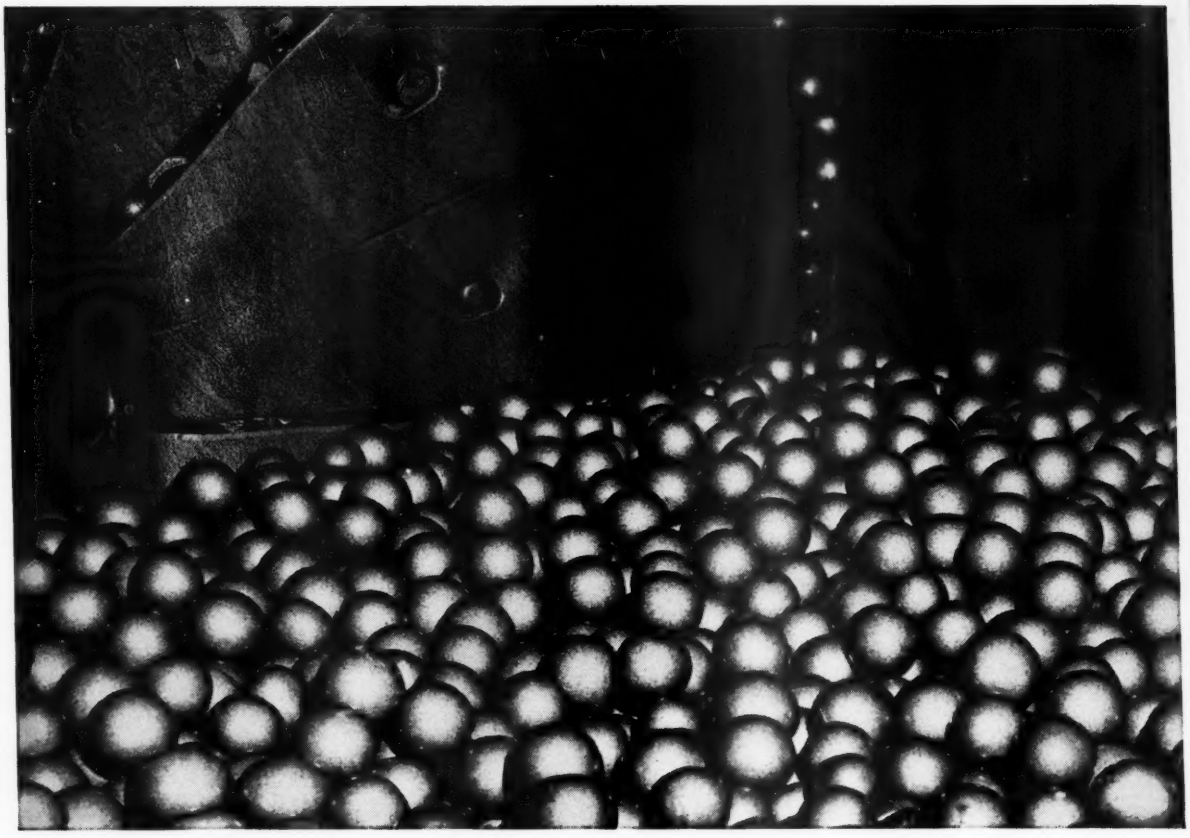

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After the luncheon, L. C. Campbell, Coal Division Chairman, spoke briefly and a panel discussed safe grounding of off-track and portable electrical equipment

Coal Division Conference

Committees Report Progress at Annual Get-Together

ON November 19 the Coal Division of the American Mining Congress met in Pittsburgh, Pa., for its 20th Annual Conference. At morning and afternoon sessions the various technical committees of the division reported on studies completed since the last meeting a year ago and on some that are now in progress. More than 250 representatives of mining and manufacturing companies were present to hear and discuss current mining problems.

These annual conferences not only report on work being done by the several committees but also provide a forum for an exchange of views on each study. Committee membership is made up of operating men and manufacturers vitally interested in each phase of mining and those who attend the meetings derive a great deal of benefit from the hard work and experience of the committee members. Each report is planned with the original objectives of the Coal Division in mind—to present the facts concerning modern mining methods and equipment to the industry without recommendation and without bias.

Luncheon Well Attended

At the well attended luncheon meeting, L. C. Campbell, vice-president, Eastern Gas and Fuel Associates and chairman of the AMC Coal Division, struck a note of optimism concerning the future of the coal industry. He pointed out that it is coal's "birthright" to be the major supplier of this country's energy requirements, directly in the form of heat or indirectly as the ultimate source of a very great portion of the electric energy it uses. Any setbacks can only be temporary. So long as this country continues to grow, the coal industry also will continue to grow. In addition to its classical role as supplier of energy, he pointed out that coal is more and more becoming a major supplier of chemical raw materials.

At the conclusion of Mr. Campbell's address, the luncheon meeting was turned over to John A. Dunn, chairman of the Underground Power Committee. He introduced C. R. Huffman, chairman of the subcommittee on grounding portable and mobile equipment. The latter presided over a panel discusison on the highly complex topic, "Methods for Safe Grounding of Off-Track Machinery and Equipment." Other members of the panel were: H. B. Buckingham, R. G. Gehlsen, W. R. Morton, E. L. Parker and E. W. Davis.

The subcommittee, of which these men are members, has been studying the question under discussion for the past three months. Their report was formulated after a number of subcommittee meetings together with numerous contacts with coal operators and equipment manufacturers throughout the industry. During the panel discussion it was brought out that there is no presently known device which is "foolproof" in satisfying all of the requirements for the safe grounding of off-track machines and equipment. For the purpose of this discussion, trailing cable was considered a part of the machine.

E. J. Gleim of the U. S. Bureau of Mines was called upon to present his opinion on points under discussion. For the present, he indicated that the Bureau would go along with any reasonable measures, but in the light of future developments, might reverse decisions made in the field.

At the conclusion of the panel discussion the luncheon meeting was adjourned and those present returned to the Monongahela Room for the afternoon session. On the following pages, an abstract of each of the Committee Reports is given. No report, as given at this meeting, is considered final. After the ideas and avenues of approach suggested in the discussion periods that followed each report have been thoroughly explored final reports setting forth the findings of the committee will be published.

RAIL HAULAGE

Committee Chairman
JAMES D. REILLY

STANDARDS FOR HEAVY RAIL TURNOUTS

J. B. HASKELL, E. E. ROECKER AND C. F. MEYER

ANTICIPATING the trend toward heavier mining equipment and faster haulage for underground service, a study on standards for 85, 90 and 100# turnouts has been started by the Rail Haulage Committee. The new designs are to supplement the previous standards, adopted in 1934, for turnouts up to and including 80# rail. A tentative report published in the January 1954 Mining Congress Journal, showed bolted frogs, cast steel frogs, and split switches (7½ ft and 10 ft) for the heavy rail; these covered turnouts with frogs up to and including No. 6. Suggestions were received from the industry for turnouts with longer switch lengths than shown for foregoing designs; accordingly, the committee is now preparing drawings and specifications for heavy rail turnouts using Nos. 7 and 8 frogs.

MECHANICAL LOADING INTO MINE CARS

G. N. McLELLAN AND J. D. REILLY

THE subject of gathering haulage for mechanical loading is being covered in a joint study by three committees—Rail Haulage, Mechanical Mining and Conveyor Haulage. It is designed to cover methods of transporting coal away from a conventional loading machine (not continuous mining), with three types of haulage equipment now in common use—shuttles, mine cars and conveyors. Purpose of the study is to show the seam and operating conditions where each class of equipment is working at high efficiency and the reports will in general describe the seam, roof support, mine layout, gathering equipment and its operation. The Rail Committee is to cover operations with mechanical loading directly into mine cars and two accounts have been submitted.

Report A

This operation mines in a seam which averages about 60 in. in thickness. A 12- to 14-in. drawslate falls when the coal is shot, and must either be loaded out or gobbed inside. The mine is fully mechanized with track mounted equipment. Ten-ton capacity mine cars are loaded by the machine at the working face, and hauled to the tipple where they dump automatically without uncoupling. Eight-ton locomotives are used for service to the loading machines. The working places have 40# track; 60# track is in the secondary and main line hauls.

Average shift production is 4801 tons of raw coal with a reject of 37.21 percent. The following cost data covering 109 shifts are for mine car haulage from the room face to the gathering side track on the entry. It should be mentioned that this data includes supply delivery for material handled direct to face.

Cost Data	Cost per Ton Raw Coal	Cost per Ton Clean Coal
Operating Labor	$0.0558	$0.0888
Track	0.0628	0.1001
Power	0.0027	0.0042
OAB Insurance, etc.	0.0041	0.0037
Total Operating	$0.1365	$0.2174
Depreciation	0.0196	0.0312
Total Cost per ton	$0.1561	$0.2486

Report B

This operation is in a 7½-ft seam overlaid by 12 in. of drawslate which is loaded with the coal. Mining is by the block system with headings and room driven 13 ft wide on 60° angles. Pillars are recovered. In the working places 15-ft lengths of 40# rail are laid on steel ties; 60# rail with Armored ties is laid on the secondary roads and 80# rail on treated wood ties is used for the main line haulage.

Track-mounted loading machines load directly into 10-ton mine cars. Face, swing and gathering haulage is by eight-ton trolley and cable reel locomotives, five in gathering service and three in swing service. A typical time study shows the following service haulage delays at the face:

	% of shift	Average
Car change	11.08	1.1 mins. per car
Hauling cars	8.04	5 trips @6 mins. ea.
Cars off track (2 times)	4.36	17.0 mins.
Spot empties	0.49	1.9 mins.
Spot loads (6 times)	2.95	11.5 mins.
Broken and dirty track	0.80	3.1 mins.
Total delays	27.72%	104.2 mins
Total shift time		6 hrs. 30 mins.
Total cars loaded		37
Average car change distance		220 ft.

DETERMINATION OF PROPER MINE CAR CAPACITY

E. T. LANG, J. D. REILLY AND D. A. ZEGEER

PURPOSE of this study is to evaluate factors that determine the most economical design and capacity for mine cars in main line haulage to suit given sets of seam and operating conditions. The report is to be based on data furnished by coal companies. Two accounts covering operations with 10-ton and 25-ton cars have been previously submitted as summarized below; these are now supplemented by a third account covering 13-ton cars.

10-Ton Mine Cars

This mine produces 4300 tps of raw coal which is hauled in mine cars to the tipple—an average distance of four miles. Main line trips have a speed of 14 mph hauled by a 26-ton locomotive. The cars are of steel construction with eight-wheel trucks and weigh 3.75 tons empty. A capacity of 10 tons makes a live-load ratio of 2.66 to 1. The cost per cubic foot of capacity is $4.41 and $190 per ton of raw coal capacity. Following is the haulage cost summary:

	Per Ton Raw Coal	Per Ton Mile
Depreciation	$0.0706	$0.0159
Operation & Maintenance	0.0987	0.0220
Maintenance Supplies	0.0158	0.0036
Power	0.0108	0.0024
Total	$0.1959	$0.0439

25-Ton Mine Cars

The mine produced, at the time the estimate was made, 3300 tons of raw coal in a three-shift operation. Rejects amount to 10 percent making a production of 3000 tpd of clean coal. Ultimate length of underground main line track will be 3.52 miles laid with 80# steel rail on treated ties. A 20-ton tandem locomotive hauls the trips at a speed of 15 mph. With automatic loading stations and with automatic car tripping and closing devices at the tipple dump, the main line requires only one motorman

(at the present time) per trip for hauling, loading and dumping. Following is the haulage cost summary:

	Per Ton Raw Coal	Per Ton Mile
Depreciation	$0.071	$0.020
Operating Labor	0.105	0.030
Supplies	0.019	0.005
Power	0.010	0.003
Total	$0.205	$0.058

13-Ton Mine Cars

This operation produces 5400 tpd in two shifts. The main line track from the tipple to the inside parting is 4.6 miles long. Two 25-ton main line locomotives haul the loaded trips at a speed of 12 mph—an average trip has 23 cars with a total of 300 tons per trip. Coal is mechanically loaded into shuttle cars at the face, which haul to an elevating conveyor that loads mine car trips. The cars have a capacity of 395 cu ft, an empty weight of 4.5 tons and carry a load of 13 tons. Following is the cost summary for the main haulage operation:

Investment: cars, locomotives, track	$0.0016 per ton-mile
Operating and maintenance labor	0.0200 per ton-mile
Operating maintenance supplies	0.0080 per ton-mile
Power (estimated)	0.0019 per ton-mile
Total per ton-mile	$0.0415

The present cars replaced wooden cars having a weight of 1.75 tons each and a carrying capacity of 2.75 tons. A comparison between the old and the new shows that 4.7 small cars equal the carrying capacity of one large steel car. At this mine there were 650 small cars in use which had a total storage capacity of 1625 tons. These were replaced with 175 of the present type steel cars which have a storage capacity of 2275 tons. The dead load weight of 4.7 small cars is slightly over eight tons while the dead load weight of the equivalent one steel car is 4.5 tons. This indicates a calculated power reduction of more than 45 percent for main line haulage. A wooden car costs $450. This means $6.82 per cu ft or $164 per ton of capacity as compared to the steel car cost of $3.29 per cu ft and $100 per ton of capacity.

ROOF ACTION

Committee Chairman
G. N. McLELLAN

THRUST AND SPEED FOR ROTARY DRILLING

A. W. CALDER, ORVAL ROBSON AND ROBERT FLETCHER

WHEN hard rock is being rotary drilled, the inevitable question will arise, "What is the optimum thrust and speed for bit life?" Before attempting an answer to this question, the effect of thrust and rpm on bit life should be studied and considered with the resultant rate of drilling. The report contains curves showing laboratory results for drilling under varying conditions of thrust and rpm. Increasing the thrust from 1800 to 3200 lb in one experiment increased the penetration rate, at 600 rpm, 9.8 to 16.5 ft per min. From the curves it is apparent that: (1) higher rpm dulls the bit faster; and (2) increased thrust results in faster drilling speed provided the thrust is within the ultimate strength of the bit. Longer bit life is achieved when the rpm is minimized and a sufficiently high thrust is used to advance the bit at least $\frac{1}{16}$ to $\frac{3}{32}$ in. per revolution.

The importance of selecting good operators was stressed as was the need for a good bit maintenance program. It has been stated that more bits are ruined by careless handling while being sharpened than in hard drilling.

Reports have a sound economic value, insofar as the use of carbide tools for roof drilling is concerned. A daily or weekly record of what happened to the bits on each section on any shift will give available information that can indicate one of the following: (1) changes in roof strata from one shift to another; (2) the necessity of making mechanical adjustments on the drill; and (3) point up the fact that one or more crews may be efficient or inefficient.

One problem that has received considerable study deals with variation in torque readings on bolts. Over the industry there has been a wide divergence of opinion on correct torque. However, it is now generally accepted that a bolt tightener is adequately set when it will produce from 150 to 175 ft lb of torque. There are indications that over-tightening has detrimental results. Excessive twist has been shown to reduce the ultimate strength of the steel.

Most machines installing bolts are adjusted to slip at a certain torque setting. To gain constant results from these machines the operator must be acquainted with the fact that frictional loses due to rubbing of the tightening tool on the shin plaster, galling of the bolt head on an angling plate, rusty threads, or only partial closing the operating valves, may all reduce the working torque on the bolt. When these facts are realized over the entire chain of management, as well as by the operator, consistent results may be expected.

DISCUSSION OF ⅝-INCH ROOF BOLTS

REPORTED BY A. J. BARRY

IN 1949-50, when a cooperative roof bolt permit system was established between the Bureau and several states, the ¾ in. diameter headed bolt was considered adequate for many installations. This was based on the use of mild steel (SAE-1020) bolts which was the only satisfactory grade available for the purpose at that time. In recent months several of the bolt manufacturers have been furnishing higher carbon steel (SAE-1040 and SAE-1045) bolts of ⅝ in. diameter at a saving to the consumer but providing sufficient strength properties as the ¾-in. bolts.

Laboratory tests made by the Bureau of Mines on ¾-in. SAE-1020 and ⅝-in. SAE-1045 headed expansion type bolts show that the yield load capacity in pure tension of the ¾-in. bolts was approximately 14,000 lb. For ⅝-in. SAE-1045 bolts the values ranged from 13,350 lb to 14,400 lb. Tests made to determine the effect of combined tension and torsion on the yield load capacity of similar bolts show that when ¾-in. bolts are fastened at the threaded end to prevent rotation and torqued to 154 ft lb before loading, the load loss averaged 4000 lb. When 70 to 109 ft lb was applied to ⅝-in. SAE-1045 bolts the average yield load capacity decreased approximately 2290 lb. The torque applied was below the average value where continuous yield should occur. These tests show that the combination of tensile and shearing stresses (torsion) caused the bolts to yield at smaller tensile loads than they normally would in pure tension.

Although these tests indicated what can be expected from the bolts under laboratory conditions, it was generally agreed that the final evaluation of the capabilities and limitations of the various types of bolts is dependent on the results obtained in field experiments and tests. Field tests of ⅝-in. diameter bolts are being made by the U. S. Bureau of Mines and upon completion a report will be prepared for publication.

In the meantime, the Bureau is taking the attitude that a ⅝-in. bolt is provisionally acceptable in mines where the ¾-in. bolt has given acceptable service, providing local tests show that equivalent properties are being provided, i.e. 8000 lb without yield and with equivalent anchorage. In view of the limited information available at this time it was the consensus of the group that further study should be made by the Roof Committee.

GEOLOGICAL STUDY ON MINE ROOF FORMATIONS

CHARLES T. HOLLAND

THIS study is to determine whether tests can be made to predict the probable roof action that will occur in partial and in complete mining; also whether such tests can recommend the type of roof support most effective. This report will be made by examinations of roof strata, underground and in strip mine high walls, and will include such factors as composition of strata, faults, intrusions and inherent geological stresses.

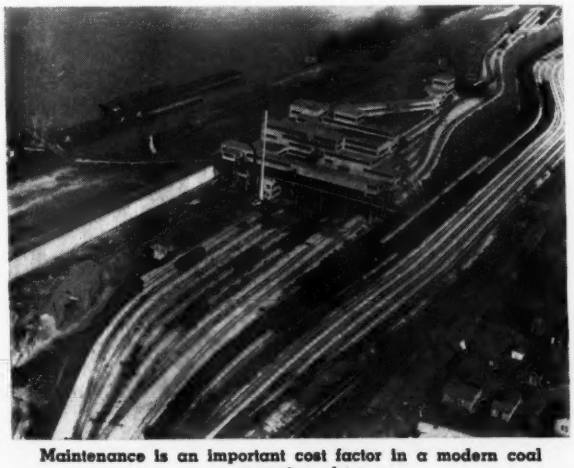
CHANGES IN ROOF BOLTING PATTERNS

ROBERT FLETCHER

SAFETY has been, and must continue to be the prime consideration of roof bolting. Miners working under hundreds of miles of bolted roof, are free from roof fall fatalities. This record is outstanding. Yet, it can be bettered. There are many sections of mines today that are not being bolted because the general concept of bolting patterns makes it economically unfeasible. Most mines are "overbolting," that is, using more bolts than needed to hold the roof. Over-bolting came about in a natural way; with little or no experience, it was necessary to be certain that enough bolts were installed to hold the roof.

Why are we now ready to study new bolting patterns? For several reasons. Because the safety of roof bolting has been established; because the bolts and shells we are now using are better; because the equipment installing the bolts gives more consistent results, and is able to keep bolting in cycle; because we know more about the effect of bolting on various types of roof. How will a study of bolting patterns benefit the industry? By making areas safe through bolting where the cost was previously too high; by reducing bolting crews or giving the crew more time to do a better job of putting up the bolts; by economies in bolting materials; by more area bolted per crew; and by helping to solve one of the continuous mining problems.

To consider a new bolting pattern for a mine, it is necessary that both Federal and State Mining Departments be consulted. A test area can then be established and maintained under surveillance for at least 60 days. While the area is being mined, it would be well to bolt in the normal manner, with any pattern changes overlaying the standard pattern. With the test area dangered off, bolts can then be removed, until only the new pattern remains. We of the American Mining Congress can perform a valuable task by developing information on bolting patterns. It is up to us to take advantage of the fact that roof bolting has come of age.



Maintenance is an important cost factor in a modern coal preparation plant

COAL PREPARATION

Committee Chairman
R. L. LLEWELLYN

PREPARATION PROBLEMS OF CONTINUOUS MINING

A preliminary report was published in August issue of MINING CONGRESS JOURNAL and the Committee is continuing its study dealing with operations by new and improved types of continuous machines.

CLEANING PLANT MAINTENANCE

THIS study is to illustrate how a number of companies have reduced "down time" in their cleaning plants by eliminating recurring delays. The reports will be based on descriptions of maintenance practices of operating coal companies. Six such accounts have already been received which include records of time lost in the cleaning plant operation from mechanical breakdowns and other causes.

Plant A has an average of 6000 tps with 10-12 percent reject. The maintenance crew of 14 men works on the third or off-shift but some maintenance is done during the first and second shifts (loading shifts). An average of 150 man-hours per 24-hour day is devoted to maintenance, or 20-25 percent of total man-hours worked in the cleaning plant. The general maintenance procedure includes regular inspection of various units; repair and replacement of spare units; progressive replacement or repair of conveyor chain, bottoms, wear plates, etc. Electricians maintain and repair all motors and electrical installation. Down times are clocked (not estimated) and a summary based on one month's operation of two shifts per day shows a delay time of 1.56 percent of the shift.

Plant B has an average production of 2900 tpd in three shifts with 10 percent reject. A plant foreman with one assistant directs the labor force of 18 men (six men per shift). Operating personnel are also trained maintenance men and carry out all maintenance work in the plant during on-shift idle time or on week-ends, as is necessary. A summary of one month's operation shows the equipment delays averaged 2.6 percent of the shift.

Plant C has an average shift tonnage of 10,075 tons with a 20 percent reject. A period of 49 shifts had an average delay of 5.29 percent of the shift from all causes. The maintenance organization consists of 32 men headed by a master mechanic with foremen and chief electrician. There are 11 men on the operating crew, who do regular maintenance work on each operating shift. Then there are 17 men who perform the scheduled jobs, which the operating crews cannot efficiently handle. In addition, there are two shop fabricating men, and two plant inspectors.

Plant D has an average dumping rate of 425 tons of material per hour which has 21.2 percent reject. The plant operates two shifts per day. Personnel used in maintenance is as follows—First shift has one repairman, one helper and one lubricator; second shift has one repairman, one helper and one lubricator; third shift has three repairmen. During a two-month period, an average of 2.7 percent of the shift was lost due to equipment delays.

Plant E has a daily production of 2500 tons of clean coal. Raw coal feed contains 15 percent reject. The plant is operated two shifts per day by a total personnel of 44 men, of which 13 are for maintenance. Seven of these maintenance men are on the third shift; three are on the first and second shifts each. Delays are clocked and in a period of 82 shifts there was an average equipment delay of 2.63 percent of the shift.

Plant F produces 7000 tons of clean coal per day oper-

ating 1½ shifts. The day crew of five men operate the plant with an additional electrical force of two men. On the second shift, five men operate the plant for the half shift that is running coal and work on maintenance during the remaining half shift.

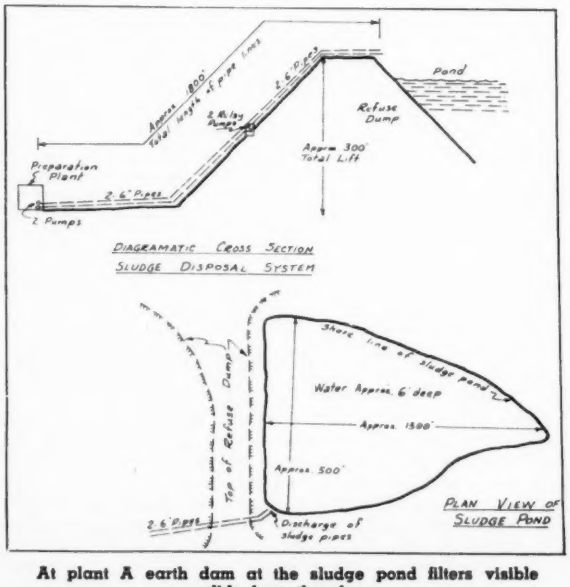
WATER CLARIFICATION

BYRON M. BIRD AND JOHN GRIFFEN

IN a broad way, methods of water clarification may be grouped according to the method used—settling, centrifugal separation, and filtering. The tentative plan for the committee study is to collect detailed information on various workable schemes of water clarification and to make them available to coal companies. As conditions differ greatly, no one scheme will fit every place. For instance, one location may be in flat terrain; another may be mountainous; another may be in a congested area. Again, one scheme of water clarification may be highly efficient and easy to operate but have a high first cost and operating cost. Three descriptions of clarification methods have been submitted as follows:

Plant A handles approximately 600 tph of raw coal. Reject is high and is composed of large quantities of slate with some soft fire clay. Much of the slate disintegrates upon contact with water. Table and cone refuse is utilized to form a dam in a large valley. Waste water from tables and other plant circuits is used to pump fine refuse and worn out sand to a point in back of this dam. Water filters through the dam and enters the creek free of visible solids. No water is recovered for plant use. A disposal line with two pumps working in two stages remove approximately 550 gpm of water carrying 30 percent minus 28-mesh solids from the operating circuits.

Plant B handles about 1500 tph of raw coal from two stripping operations and one underground mine. There is no trouble with clay in the plant effluent. The solids settle rapidly even though about 70 percent is finer than 325 mesh. As the settling pond fills up, its area is of course reduced. Adequate clarification is with one acre of water surface. The solids are removed from the settling pond with a barge mounted dredge pump and two other pumps ashore in series. These deliver the settled material to a large storage basin at a higher elevation and the clear water from this area returns to the settling pond. One man on the barge can remove in one shift more than the amount of solids coming from the plant in three shifts. It is planned to recover this fine coal by froth flotation.



At plant A earth dam at the sludge pond filters visible solids from the slurry

Plant C is located along a creek in a moderately steep valley and at some distance from any large center of population. The water and fine coal from the cleaning plant go to the raw coal drag tank. The plant effluent is made up from a portion of the overflow from this raw coal tank and the clean coal tank and flows by gravity at the rate of 1000 to 1200 gpm to a small sump. Two 75-hp pumps in series then deliver this slurry to a settling pond through some 1500 to 2000 ft of eight-in. pipe. The clear water overflow is returned by gravity to the plant. No trouble is experienced with settling due to clay.

UNDERGROUND POWER

Committee Chairman

JOHN A. DUNN

GROUNDING MOBILE AND PORTABLE FACE EQUIPMENT

C. R. HUFFMAN, H. B. BUCKINGHAM, R. G. GEHLSEN, W. R. MORTON, E. L. PARKER AND T. R. WEICHEL

METHODS for positive and safe grounding of electrically operated machines underground have been the subject of intensive study over a period of years and in March 1948, this committee published a preliminary report, "Grounding Off-Track Mining Equipment." Their recommendations at that time concluded with the following statement: "The committee will reconsider the subject at any time it seems desirable to do so."

Present design of twin Type G trailing cable with its 50 percent rectangular shaped ground wire has contributed to some failures. Several mine operators have objected to its use as compared to two-conductor cable from the standpoint of: (1) its added expense, (2) it is a heavier and less flexible cable, (3) the inability to wind as much cable on the reel as with two-conductor cable, (4) higher maintenance, (5) breakage of the grounding conductor, and (6) failure of the workmen to splice properly. These difficulties have led to a number of alternate methods proposed as a substitute for the grounding conductor.

The committee has studied six schemes but these are not recommended because of the delicacy of the equipment and the temptation for operating personnel to thwart their usefulness. The committee recommends for consideration the Canadian safety requirement: "Grounding conductors to have capacity equal to ⅓ largest conductor in circuit but not less than No. 8." The committee further recommends in conjunction with the smaller grounding conductor, the adoption and use of a suitable safety ground trip in combination with fast operating (one second or less) automatic opening circuit breakers.

Until a satisfactory device is developed that will take the place of the Type G cable, the committee feels that the present system should continue to be used, as it fulfills the greatest number of basic requirements which may be defined as follows: (1) Voltage above earth, which may be hazardous to human life, shall not appear on the machine frame; (2) the allowable voltage and current from machine frame to earth shall not produce incendiary sparks or arcs capable of creating fire explosion hazards; (3) it is desirable that devices affording the above protection be fail safe; and (4) a machine is defined to include all components thereof, including the trailing cable.

In conclusion, the committee desires to emphasize that it does not discourage further experimentation looking to the possible development of some device or system that will take the place of the present grounding system.

MINING MACHINE MOTOR IDENTIFICATION

F. R. HUGUS, J. A. BUSS AND E. L. PARKER

MOTORS on mining machines are designed and applied to meet such special conditions that many manufacturers have felt justified in placing special terminology on the name plates rather than use established terms to convey the identity of the motor to the user. Such a practice leads to confusion and makes it quite difficult to select the proper capacity of the conversion and distribution equipment. It is recommended that the mining industry consider the standards of ASA and NEMA to see if they could be adapted to mining practices. These provide that motor name plates present the following minimum amount of information: Manufacturers' type and frame designation; horsepower; kind of rating (time rating); temperature rise at rated loads; rpm at rated load; voltage; amperes at rated load; and type of winding.

In order that the significance and value of these terms may be understood better, certain information is presented in this report which is divided into four sections: (1) General information on motor application, (2) the effect on motor operation of change in voltage, (3) temperature considerations in the design, application, and use of motors, and (4) relation between speed and load.

Basis of Motor Rating: NEMA standards define a motor rating as, "The rating of a machine shall consist of the output together with any other characteristics, such as speed, voltage and current, assigned to it by the manufacturer." It should be understood that the nameplate output of the motor in horsepower is meaningless unless it is tied to a duty designation. Standard duty designations are: continuous; 5 minutes; 15 minutes; 30 minutes; 60 minutes. When the nameplate reads "continuous" duty, it means that the motor may be operated continuously at the nameplate horsepower without exceeding the temperature rise indicated on the nameplate. Likewise a 60-minute duty means that the motor may be operated steadily at the nameplate horsepower for 60 minutes without exceeding the nameplate temperature rise. Motor designs are factory tested to assure that the temperature rise at name plate load does not exceed the nameplate temperatures simits. The factory tests and the methods of testing are defined and standardized in the test codes of National Electrical Manufacturers Association and the America Institute of Electrical Engineers.

It is seldom that the demands on an application require the motor to be operated exactly at its nameplate rating. For this reason the application engineer calculates an equivalent continuous or short time duty and then selects the proper design to fit the application.

PROPOSED SPECIFICATION FOR HIGH VOLTAGE NON-METALLIC SHEATHED MINE POWER CABLES

E. W. DAVIS

THIS specification covers heat, moisture, and ozone-resistant rubber insulated shielded, three conductor, neoprene sheathed cables with grounding conductors in sizes 6 to 4/0 awg for nominal a-c voltage services of 5 and 10 kv. They are available with two grades of insulation for operation at copper temperatures of either 75°C or 80°C. For guidance, the approximate phase to phase, 60 cycle, volts drop per amp per 1000 ft at various circuit power factors and current carrying capacities of these cables are given.

Conductors shall be made of annealed coated copper wire in accordance with IPCEA General Specifications S-19-81, the physical and electrical properties of which shall conform to either ASA Standard #4.4, 1947, or ASTM B 33 for tin coated conductors, or ASTM B 189 for lead or lead-alloy coated conductors. For borehole and shaft cables, medium hard-drawn copper may be used; the factor of safety shall not be less than seven.

Grounding Conductors shall be made of annealed, coated copper wire in accordance with IPCEA Specifications S-19-81, and shall be Class B stranded. One grounding conductor shall be placed in each interstice of the cable in contact with the metallic shielding. The size of each grounding conductor shall be as listed in Table 1. The aggregate cross-sectional area of the three grounding conductors shall be not less than 90 percent of the area of one phase wire. The minimum individual grounding conductor size shall be 10 awg.

Strand Shielding: Semi-conducting tape or other form of strand shielding shall be applied over the conductor.

Insulation shall be in accordance with IPCEA Specifications S-19-81.

Conductor Identification shall be a colored tape or other fibrous covering in accordance with IPCEA Specifications S-19-81.

Metallic Shielding shall be applied over the individual conductors in accordance with IPCEA Specifications S-19-81.

Sheath shall be neoprene in accordance with IPCEA Specifications S-19-81.

Over-all Diameters of the cables shall be as listed in Table 1. A tolerance of plus 8 percent and minus 5 percent will be allowed. (Note: Table 1, shows specifications for three conductor shielded cables, giving (1) diameter of strand, (2) size of grounding conductors, (3) insulation thickness, (4) over-all diameters; listing eight cable sizes from No. 6 to 4/0, for 5000 and 10,000 v.)

CONVEYOR HAULAGE

Committee Chairman

H. A. JONES

MECHANICAL LOADING ONTO CONVEYORS

THIS study is a part of the joint report being made by three committees—Rail Haulage, Mechanical Mining and Conveyor Haulage. Its purpose is to cover methods of transporting coal from a conventional loading machine with three types of equipment—shuttles, mine cars and conveyors. The following account describes an operation using a chain conveyor for the service haulage unit.

This operation produces approximately 1250 tpd, mined with crawler-mounted loading machines, which discharge directly onto a chain conveyor. The chain conveyor transports to a 30-in. belt laid in the entry; the total length of belt haulage from the working panel to the cleaning plant is approximately 2½ miles. Supply and personnel transportation is served by rail haulage from a portal approximately one mile from the working area. This phase of the transportation is handled with battery locomotives and supply cars 19 in. high, operating on 30# rail, which is kept advanced to the working sections.

The seam mined is about 36 in. thick, underlaid with about six in. of soft, poor quality coal and approximately three in. of soft fire clay. The roof is of shale and draw rock which varies in thickness from 0 to 15 in. and requires close timbering. Because of the high ash coal at the bottom of the seam and the underlying fire clay, off-track haulage was not considered feasible at this operation. The close timbering and the low height did not permit thick cross-bars, which were factors to be considered if track haulage was used. Chain conveyors have helped overcome these problems of soft bottom and poor top. At the present time, shortwalls skidding over the floor, as well as the crawlers on the loading machines, plow up the bottom to some extent. Even with this objection the advantages of this transportation system in overcoming the adverse mining problems encountered have been demonstrated.

FLAME RESISTANT CONVEYOR BELTING

J. L. THORNTON AND M. J. SPAN

ALTHOUGH most mine fires in the United States where conveyor belting is involved do originate in outside sources such as power cables, lubricants, coal dust, waste accumulations and oil spillage, it is certainly a step in the proper direction to develop satisfactory fire-resistant belting. The present price of fire resistant compounds is approximately 18 percent above the price for the same belting compound specification and its universal use is retarded for that reason.

The use of fire-resistant belting for all installations underground will not be a panacea for this problem on account of the "outside sources" listed above. Cleanliness of the conveyor system will contribute substantially to the elimination of the fire hazard. The rubber belting manufacturers, however, are accelerating their work to develop a satisfactory fire-resistant product.

There are certain fundamental requirements of a conveyor belt carcass to do the job properly. There must be enough body in the fabric and proper number of plies to support the specified load without excessive sag. Although sag is a function of belt tension and idler spacing, that feature must receive consideration. There must be enough strength in the carcass to prevent overstressing during normal operation. In addition, there must be enough strength in the carcass to absorb surges in excess of the average load. It is beyond the scope of this paper to outline in detail each rubber manufacturer's exact specification for his particular belting. Suffice it to note here that there should be a certain relation between fill threads and warp threads of each ply of fabric to produce a balanced construction.

Certain features in regard to manufacturing fire-resistance belting probably will include a designation that: (1) Reinforcement plies shall be of fabric and/or cord; (2) there shall be friction and skim coat compounds of fire-resistant material; (3) the top and bottom covers shall be of the fire-resistant compound; (4) a breaker may or may not be included in top cover; (5) in addition to the friction coat, the thickness of the skim coat will be specified; and (6) the covers, friction and skim coat compound will be specified.

It was the consensus of the Conveyor Committee meeting in September that some mention should be made of protective devices to be used in connection with the operation of underground conveyor belting installations. This feature has been rather fully covered in several papers, the most recent is a committee report by S. T. Allsbrook on "Belt Fire Prevention," published in the MINING CONGRESS JOURNAL, October 1953.

MECHANICAL MINING

Committee Chairman

WM. E. HESS

MAINTENANCE OF CONTINUOUS MINING MACHINES

W. J. SHIELDS, E. H. JOHNSON, RUSSEL VANCE AND J. A. YOUNKINS

ABOUT a year ago, the committee began a study to determine the cost of labor and material to maintain continuous mining machines. A number of companies were contacted and data were submitted on 33 operations, showing time delays from all causes in a continuous mining panel. A preliminary report was published in the September 1954 issue of MINING CONGRESS JOURNAL. While the data were considered indicative, the committee decided that a further effort should be made to expand this report by collecting accurate machine maintenance costs. It was further desired that such costs would cover both continuous and conventional mining so that comparison could be made between the maintenance costs of these two types of equipment.

The purpose of the committee is (1) to develop field information that would be helpful to the designers of this type of equipment in overcoming faults and limitations that may be corrected in design; (2) to point out the need, which is still only partially recognized, of proper selection and adequate training of operators and maintenance personnel; and (3) to help operating officials to a realization of their need of getting full information on their own costs of continuous miner maintenance in time and money, to help us all to do a better job. It proposes to continue this study by going back to those who gave us the first data and getting them to bring it up to date.

Reports have now been received from seven operating companies and the following account is typical.

Mine A operates 14 continuous machines. Their length of service varies from six months to 5½ years. The seam mined has an over-all average height from 6½ to 7 ft, consisting of 5½ to 6 ft of coal and 12 in. of hard draw-slate. Frequent clay veins appear in the seam, roof, and bottom and present problems—both for the machine cutting and roof control.

CONTINUOUS MACHINE DELAY TIME

1.	Number of shifts covered	3,855
2.	Average shift working time	6.85 hrs
3.	Machine operating time	3.72 hrs
4.	Machine delay time	0.44 hrs
5.	Delays in the Panel	2.69 hrs

MAINTENANCE COSTS PER TON MINED FOR CONTINUOUS CONVENTIONAL LOADERS OPERATING UNDER SIMILAR SEAM CONDITIONS

	Continuous Machine	Conventional Loader
Number of shifts worked	3,855	7,812
Tons produced (raw)	884,631	2,031,999
Maintenance labor cost	$0.19	$0.16
Maintenance material cost	0.17	0.12
Total maintenance cost	$0.36	$0.28
Rebuilding labor cost	$0.03	$0.03
Rebuilding material cost	0.06	0.08
Total rebuilding cost	$0.09	$0.11
Maintenance and rebuilding	$0.45	$0.39

A panel is approximately 1600 by 508 ft, with four entries driven in advance by track-mounted loading machines. Rooms are driven on one side as the entry is retreated and both the rooms and chain pillars are extracted with continuous machines. The rooms and entry blocks are 112 by 112 ft. Each machine works three shifts every day the mines operate. For the first six months of 1954 the average raw coal shift tonnage per machine was 230 tons.

Each face entry, which normally has three machines operating, is equipped with a small shop where parts are stored. The key mechanic is in charge of this shop, and rebuilds chains, jacks, etc., when not trouble shooting on any of the three sections where the mechanics may require his help. All repairs are made right on the working section and only when the machine requires a shop rebuilding is it removed from the section to the General Machine Shop which is located on the outside.

The tonnage mined by any particular machine, before rebuilding is necessary, is dependent upon the usage to which the machine was subjected. As an example, one

machine driving entries had to be rebuilt after mining only 65,600 tons. This same machine on retreat, mined 290,000 tons before rebuilding was necessary. Rebuilt machines are the oldest units, being from 3½ to 5½ years in service. The newer machines with improvements and reinforcing have not required any rebuilding as yet. Thus far it would appear if the machines are kept on retreat, that 300,000 raw tons would not be too much to expect before rebuilding is necessary. Following are operating data and maintenance costs.

MECHANICAL LOADING INTO SHUTTLE CARS

STEPHEN KRICKOVIC

THIS study is a part of the joint report being made by three committees—Rail Haulage, Mechanical Mining and Conveyor Haulage—covering methods of transporting coal from a conventional loading machine. The following accounts describe two methods of shuttle car gathering.

Mine A operates in a seam which has a height of 38-50 in. The general dip is 1.75 percent with local variations approximating 3 to 4 percent. In general, the mine floor is satisfactory for shuttle haulage but if wet conditions occur at abrupt grade changes, much trouble is encountered requiring either loading out soft material or bridging. Roof support does not affect the haulage performance adversely. When seam height drops to 40 or 38 in., smaller diameter shuttle car tires and two-in. headers are used.

Mining is by the room and pillar system in development and retreat. The mechanical loaders discharge into shuttles which haul to a 30-in. belt conveyor in the entry. The maximum belt length is 2000 ft and it loads into 10-ton mine cars on the main haulage. A chain conveyor is used as a feed from the shuttle car to the belt. Two three-ton capacity shuttles are used with each mechanical loader.

Production per machine shift is 175-300 tons of clean coal, with an average of 220 tons. Work time available in the section is 6 hr, 49 min. The loader at the face is in operation 41 percent of available time. The usual round trip shuttle haul varies from 480 to 650 ft, average 565 ft. Shuttle car delays average 15 to 20 percent of available time. Shuttle car change time is 54 sec. Moving or extending the loading point is done by special moving crew on the third shift; a full shift is needed, using three men.

Mine B operates in a seven-ft seam which is generally flat with local dips of one percent to two percent. Fireclay bottom is capped usually with one in. of hard pan. The floor is generally dry, but when wet it creates a serious haulage problem. The top has 12 in. of top coal, 12 in. of drawrock, 10 in. rooster coal and weak black slate. Roof bolting used throughout except in pillar lifts. With bolting, no clearance problem exists. The mining plan is the block system. The machine loads into the shuttles which discharge directly into 3.5-ton capacity mine cars, or in some cases, into an elevating conveyor which in turn loads into mine cars. Three types of shuttles are used: (1) Battery cars with four-ton capacity; (2) cable cars with six-ton capacity; and (3) cable cars with six-ton capacity. Three shuttle cars are used with each mechanical loader.

Average production per machine shift is 290 tons of clean coal; the time available in section is 6 hr 15 min. The loader is in operation 35 percent of available time. Average round-trip distance per shuttle haul is 1030 ft. Shuttle car delays average about 20 percent of available time; shuttle change time is 62 sec. Moving or extending the mine car loading point requires 30 man-shifts; this work is done without production interruption.

MINE VENTILATION

Committee Chairman

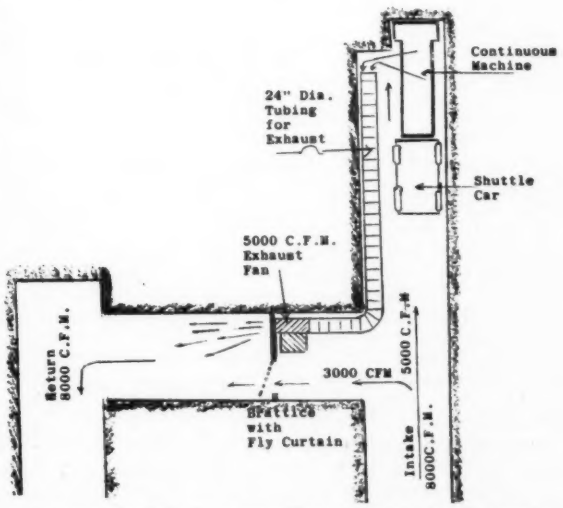
A. J. OPPERMANN

EXHAUST DUST CONTROL IN CONTINUOUS MINING

A. E. CONDON

IT is a recognized fact that more efficient ventilation should be provided around working faces in using continuous mining. Normally, ventilation has been provided by using brattice cloth extended along one side of the working place, but it has been suggested that this be augmented by the use of an exhaust fan set in a breakthrough so as to discharge directly into the return air course. A line of flexible tubing would be extended by means of short practical lengths from the fan to a point as near as possible to the working faces. The entrance to this tubing could be located so that a continuous, positive flow of fresh air would be drawn over the mining equipment toward the corner of the working face, pulling in air heated by the machines and dust originating at the face, as well as at transfer points.

In cooperation with a coal company in Western Pennsylvania, permission was obtained from the State Department of Mines to try one of these installations. In order to determine the pressure required for volume of approximately 5000 to 6000 cfm through 200 ft of tubing, a small unit was set up for an experimental installation without the mine being in production. Thirty-five sections, each six ft long, were connected to the fan and extended along the floor, as they would be in normal operations. One large radius curve was necessary. About 160 ft of the tubing was in a more or less direct line to the face. Under this condition the fan pulled approximately 5500 cfm through the tubing with 3.2 in. wg.



An experimental exhaust ventilation system for continuous mining

Questioning of several workmen in the section where this system is used showed that material benefits were obtained, among them increased visibility and by lowered temperature of the sounding air, making it more comfortable. It is also believed that the explosion hazard is more quickly dissipated by drawing dust and gas accumulations through the tubing without passing it over the machinery.

The Rifle Colo. plant of the U. S. Vanadium Co. is the oldest operating mill on the Colorado Plateau. Built in 1925 it is still processing uranium-vanadium ores

Processing Uranium Ores

Present Methods of Treating Colorado Plateau Type Ores Summarized

By D. M. KENTRO
Metallurgical Advisor
U. S. Atomic Energy Commission

IT is proposed here to outline some of the methods used in processing uranium ores, particularly those originating in the Colorado Plateau area. Because they are important to national security, the details of certain steps are of a classified nature, and cannot be disclosed here. However, the information on these classified techniques is available to cleared personnel of companies either engaged in uranium ore processing or about to get in the business.

Until the past year or two, the principal type of ore being fed to the processing plants of the Plateau originated in the Salt Wash member of the Morrison sandstones; the uranium content was derived from the secondary uranium mineral called carnotite, there were minor amounts of organic material and other uranium minerals, and the lime content was below 5 percent CaO equivalent. All the ores being processed then had substantial amounts of vanadium, in ratios of 5 to 15 parts of vanadium per part of uranium. The picture has changed quite a bit recently and ores now being processed contain a large variety of uranium minerals, of both primary and secondary origin; in some cases the ores are essentially limestone, others are igneous, and there are several sandstone types instead of one. In some cases now the vanadium content is less than the uranium content. Instead of uranium being the by-product from a vanadium operation, the situation is reversed with the vanadium being a by-product of uranium ore processing.

Based on Hydrometallurgy

Processing of uranium ores to produce a marketable uranium concentrate is at present based on hydrometallurgical means. Physical concentration methods play a minor role. Roasting with salt to solubilize the vanadium content, baking to improve filtering and settling rates, and roasting to destroy carbonaceous or organic material also play an important part in many of the uranium mills in the Colorado Plateau area. For the most part, roasting or baking take place after dry crushing to a 10 to 14 mesh range and prior to wet grinding and leaching.

Uranium minerals in the Plateau area can be dissolved either by dilute mineral acid solutions or hot carbonate solutions. Where primary uranium minerals are present, it is necessary to use a leach solution that has oxidizing power in order to obtain decent dissolution of uranium. Whether acid or carbonate leaching is used depends on the type of ore, and the choice is generally based on the relation of recovery to cost.

Where organic material is present in large amounts, 0.5 percent of carbon or more, it is difficult to maintain the oxidizing power of the leach solution throughout the leaching cycle; often enough in such cases part of the uranium content of the ore is also closely tied to the organic material and a roast to destroy the organic material and, at the same time, open up the uranium mineral is necessary prior to leaching. An oxidizing roast at 450°C to 550°C for ½ to 2 hr is generally sufficient to do the job. Higher temperatures will eliminate organic material quicker and more completely; however, the uranium content is made more resistant to attack by leach solutions when roasting temperatures over 550°C are used, and the result quite often is poorer extraction if such temperatures are used.

Acid Leach Process

Of the mineral acids, sulfuric acid, because of its lower cost and efficiency, is used; although acids such as hydrochloric and nitric have been given consideration. Hydrochloric acid, made

as a by-product of salt roasting, is added along with sulfuric acid to the leaching circuit in some mills. Where oxidizing agents are required, either manganese dioxide or sodium chlorate are used. The amount of sulfuric acid required varies from 50 to 500 lb of acid per ton of ore fed to the leach. Leaching times required for good dissolution vary from one to 24 hr. Continuous leaching in mechanically agitated acid-proof tanks is generally employed, although there seems to be merit, cost wise, in the use of acid-proof Pachuca or Brown type tanks on a batch basis. For the most part, the evidence is that a minus 35 mesh grind is adequate, and quite often results with a minus 10 mesh grind are satisfactory. Pulp densities during the leaching step are in the range of 35 to 60 percent solids, the choice being controlled by the viscosity of the pulp at various densities.

Uranium ore treatment plant of U. S. Vanadium Co. at Uravan, Colo.

Moderate Heating Helps

The use of heat to speed up reaction rate and improve extractions has been investigated thoroughly; temperatures in the range of 30 to 40°C are satisfactory. Higher pulp temperatures generally lead to higher acid consumptions and to the dissolution of greater amounts of other minerals without any appreciable improvement in uranium extraction. Under proper conditions the extraction of uranium by acid leaching is on the order of 85 to 95 percent.

Mills in the Four Corners Area are expanding to meet the need for additional processing facilities for Colorado Plateau type ores

As might be expected, the action of the sulfuric acid solution, which will have anywhere from 20 to 200 lb of free acid per ton of solution at the end of the leaching cycle, dissolves considerable quantities of other minerals than the uranium minerals. Such acid leach solutions contain appreciable amounts of iron, both in the ferric and ferrous states, vanadium, aluminum, magnesium, phosphate, and minor amounts of metals such as molybdenum, copper, and manganese. The corrosive action of these solutions, particularly when combined with the abrasive action of the solids in the pulp, is strong. Stainless steels, such as No. 316, rubber lined steel, and recently some of the synthetic plastics, are used a great deal to counteract the effects of both corrosion and abrasion on equipment. Nevertheless, maintenance is an important problem where acid leaching is used, and much remains to be done in designing better equipment for such use.

Increase Settling Rate

Having put the uranium, with many other elements, into solution by acid leaching is the easier part of the job of making a marketable product. Separation of the leach solution from the solids so as to obtain a clear liquor with the dissolved uranium in it for further processing is not an easy task, since most Plateau ores filter and settle slowly; washing rates are poor also, so that good recovery of dissolved values during filtration is a problem.

Baking or roasting of the ores prior to leaching improves filtering and settling rates sufficiently in most cases to make use of filters and thickeners practicable. In the last year, the use

of chemical additives has been investigated thoroughly, and one or two of the compounds investigated have shown great promise, particularly in the improvement of thickening rates. Some of the reported thickening rates resulted from the use of such additives are impressive, being in the range of one sq ft per tons per day thickener area requirement. When this is related to the fact that the raw ore leached pulps in many cases will show hardly any settling in 24 hours, the action of the chemical additives is of great importance and the operating plants are making tests of such compounds.

Develop Direct Recovery

Acid-proof filters and thickeners are not cheap in first cost, and the maintenance costs are appreciable. Another answer to this difficult problem has been worked out in the laboratory and the pilot plant. The process involves direct recovery from the acid leached pulp of a high grade uranium product by chemical means. The equipment used is simple and has been tested extensively; pilot plant operation has been in cooperation with several uranium mining companies who have expressed interest in the process. The use of the process permits a rather simple flowsheet with few elements:

(1) Crushing followed by a wet grind.
(2) Acid leaching.
(3) Recovery of dissolved uranium directly from the acid leach pulp as a chemical precipitate.
(4) Drying and packaging of the product for shipment.

The details of this process are rated as classified information but are available to cleared personnel of companies active in the field.

Where the acid leach solution is separated from the solids (as is normally done) by either filtering or thickening steps, a number of chemical methods are employed in the several Plateau plants to recover the dissolved uranium as a high grade product. The Commission has sponsored a great deal of development work on this phase of uranium recovery. Two of the methods developed are in use now in uranium plants in this country and elsewhere. One process is quite attractive from the standpoint of cost, ease of operation, uranium recovery, equipment, and grade of final product. A third method is now in the final stages of development and offers promise also.

There is nothing complicated about these methods, and any mining company having a mill staff with the normal amount of technical background can take hold of such processes and operate them efficiently. The need for a good selective process at this point in the acid leaching plant comes about from the fact that there are a great many elements other than uranium in the acid leach solution. These would come down with the uranium if the solution was neutralized with an alkali base so as to precipitate the uranium. There are plants now that do just this, and then treat the resultant low grade uranium precipitate by first leaching it with sodium carbonate solution, and following with re-precipitation from the carbonate leach solution to end up with a product of suitable grade. The newer processes appear to have the advantage as far as cost, simplicity, over-all recovery and flexibility are concerned; although they do have some problems connected with them. In some cases the opinion has been advanced that these problems outweigh the advantages. However, in every case where a new plant has been designed, and construction started, in the past year, the newer methods have been chosen by the mining companies involved.

Carbonate Leach Method

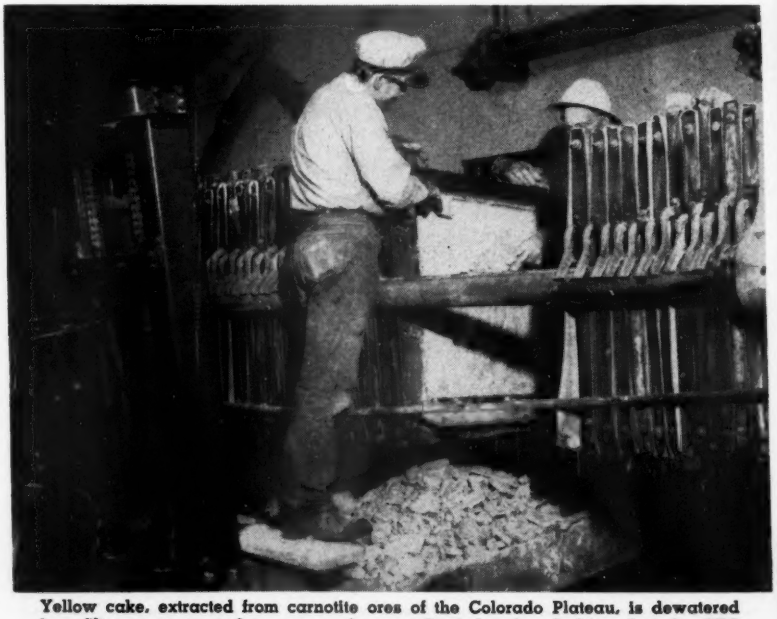
Leaching of uranium ores with hot sodium carbonate solution is the practice in several of the Plateau plants. Generally speaking, sodium carbonate solutions do not dissolve uranium minerals as completely as do sulfuric acid solutions, particularly where the uranium content of the mineral is in a reduced state. Because corrosion problems are less severe in sodium carbonate leaching circuits than acid leaching circuits, development work on improving sodium carbonate leaching is being pushed to improve the leaching efficiency. Furthermore, appreciable quantities of ore containing more than 15 to 20 percent lime are being discovered; consumption of acid on such ores is considerable, and if practical means to get the same uranium extraction with carbonate as with acid can be developed, there would be a considerable economic advantage on the side of carbonate leaching.

In carbonate leaching, solutions with 5 to 10 percent sodium carbonate and 1 to 5 percent sodium bicarbonate content are used. Leaching times on the order of four to twenty-four hours are necessary, with pulp temperatures in the range of 140°F to 240°F being required for good results. In cases where there are either primary uranium minerals or the ore has reducing elements, such as organic materials, oxidants such as potassium permanganate or high pressure air are helpful in improving uranium extractions. On some ores finer grinding is more effective in improving extraction with carbonate leach solutions than is the case with sulfuric acid solutions. The density of the pulps during leaching is kept as high as is practical in order to hold down on the cost of heat and chemicals. Equipment used is for the most part well covered and insulated mechanically agitated vessels, and the leaching is done on a continuous basis.

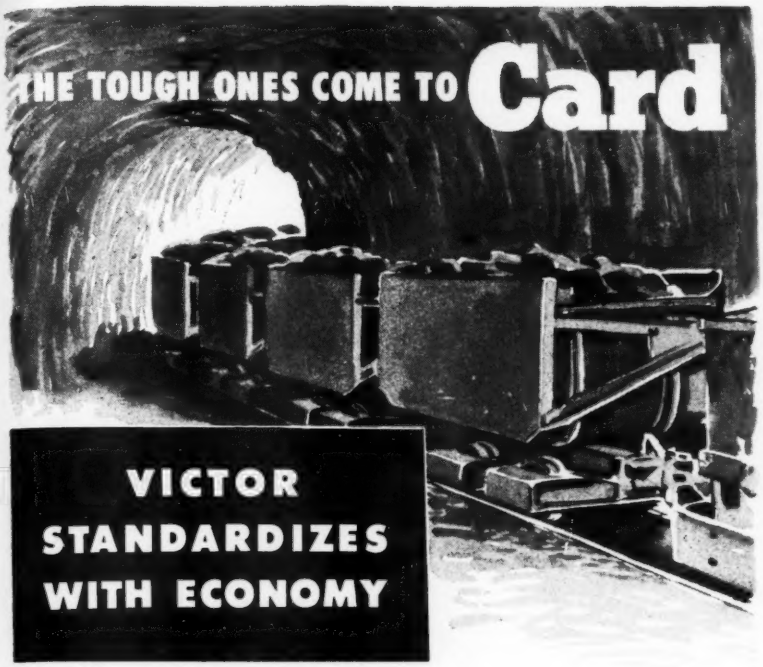
The separation of the leach solution from the solids in Plateau ores, except for one case where the feed is a limestone ore, is not easy. Baking the ores prior to leaching at 450°C improves filtering and thickening rates appreciably. The use of chemical additives is being investigated and the early results have been encouraging.

The resultant sodium carbonate leach solution is quite free of dissolved

(*Continued on page* 71)



Yellow cake, extracted from carnotite ores of the Colorado Plateau, is dewatered in a filter press, treated to remove the vanadium, fused and shipped to the AEC as a black oxide of uranium



VICTOR STANDARDIZES WITH ECONOMY

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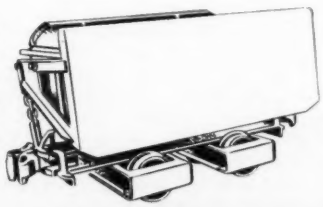

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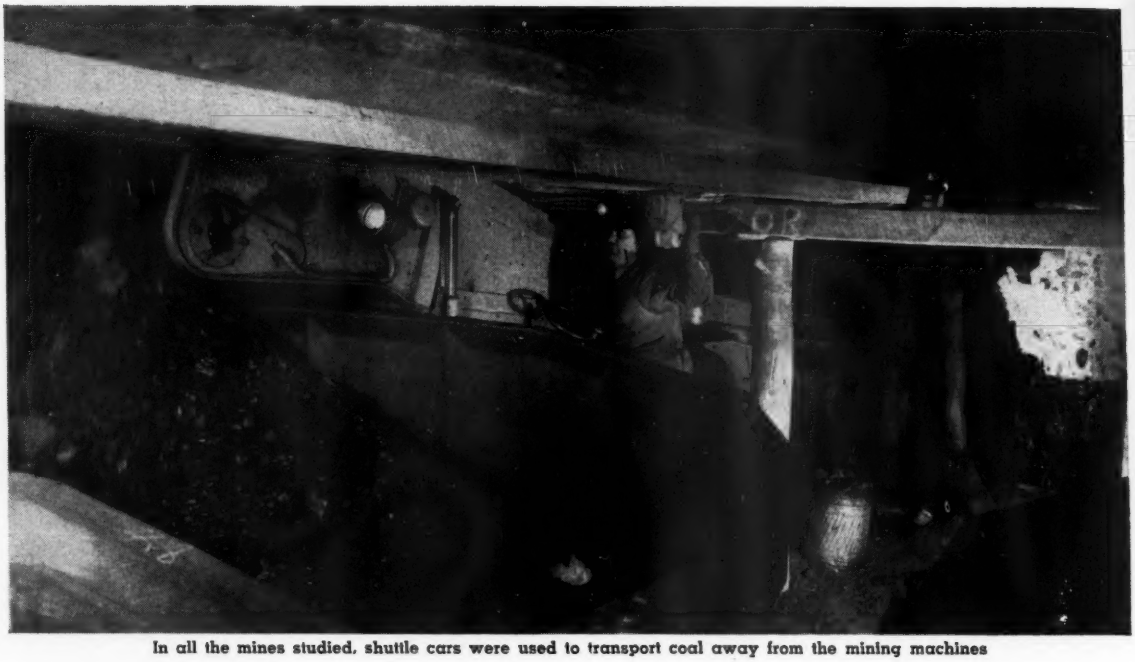


In all the mines studied, shuttle cars were used to transport coal away from the mining machines

Methods of Mining With Continuous Mining Machines*

Study of 20 Mines Shows Continuous Mining to be Most Productive Whether Pillars are Extracted or Not

By J. J. SHIELDS, M. O. MAGNUSON, W. A. HALEY, and J. J. DOWD
U. S. Bureau of Mines

THIS report deals with the operation referred to in coal mining as continuous mining. Although not always as continuous as the name implies, it is a system of mining in which a machine is used to cut and load coal in one continuous operation without drilling and blasting. With the conventional mining equipment in most general use today, the usual cycle of operation in mining of coal is: (1) Timber, (2) cut, (3) drill, (4) blast, and (5) load. As the phases of this cycle cannot be performed simultaneously in the same working place, it is necessary to operate simultaneously from three to seven working places so that at least one place is available for coal loading at all times. Even if the schedule of the phases in a cycle is maintained, coal production ceases during the time required to move the loading equipment from one loading place to the next.

History

It has long been the ambition of the coal industry to develop a machine which could effectively combine several steps of the mining cycle and thus simplify the mining system. In 1920 a continuous-type mining machine was installed in an Illinois coal mine to drive entries. Several other companies used these entry drivers for short periods in the following few years. In 1927, a southern Illinois coal company installed two of these machines. In the next 25 years, they were reported to have driven over 200 miles of entries. The machines did not attain widespread usage.

In a paper given before the American Mining Congress in 1948, it was reported that a coal-mine operator in 1926 foresaw a demand for smaller sizes of coal. For five years, he made unsuccessful efforts to persuade equipment manufacturers to construct a machine that could cut and load coal from a solid face in a single operation without blasting. Finally, the aid of a manufacturer of sugar beet machinery was enlisted, and in 1946 the forerunner of one of the present-day continuous-mining machines was placed in operation. Rapid strides have been made since that time, and many other types of continuous-mining machines have been made or are in the experimental stage.

Types of Machines Studied

Three general types of continuous-mining machines are included in this study. They are referred to as types A, B, and C.

Type A

Type A machine applies a ripping action to the coal face with cutting bits set in chains or sprockets moving at high speed. No distinction is made as to whether the cutting head moves upward or downward or transversely at an angle on the coal face during mining.

* Extracted and reprinted from Bureau of Mines Information Circular 7696.

Type B

Type B continuous-mining machine applies a slow-speed boring action to the coal face through a series of rotating arms in which the cutting bits are held.

Type C

Type C continuous-mining machine applies a slow-speed boring action also, but this action is applied by two rotating arms equipped with cutting bits. This type uses cutting chains for trimming unmined coal in the top and bottom of the working face.

Summary and Conclusions

The conclusions and curves given in this report are the result of detailed studied of 20 mines in six states—Alabama, Illinois, Kentucky, Ohio, Pennsylvania, and West Virginia. Conclusions regarding: (1) Mining system and recovery; (2) roof control; (3) face haulage; (4) productive time; (5) comparison of performance of continuous-mining and mobile-loading units; and (6) production curves follow:

(1) *Mining systems and recovery***.—Mining systems follow the conventional room-and-pillar or the block development plan or modifications thereof. Pillars were extracted wholly or in part by continuous-mining machines in 12 of the 20 mines studied. The percent of production and recovery by continuous-mining methods at these mines follow: three mines, 100 percent of production with recovery ranging from 85 to 90 percent; four mines, 65 to 85 percent of production with recovery ranging from 60 to 92 percent; four mines, 21 to 37 percent of production with recovery ranging from 85 to 93 percent; and one mine, 4.8 percent of production with 96 percent recovery. Recovery figures include mining by continuous-mining mobile-loading, and hand-loading units in nine of the 12 mines.

(2) *Roof control.*—As in conventional, hand-loading, and mechanical mining methods, effective roof control is most important. A method of roof support must be provided that will insure safety to workmen and equipment and allow the continuous-mining machine to operate without undue delay. Roof bolting was used to advantage in some mines; in other mines, wood and steel crossbars were set on steel jacks or wood posts; and other mine roofs required only wood or steel posts with wood cap pieces. Roof conditions generally were better in the continuous-mining sections of a mine than in the mobile-loading sections.

At the cleaning plants at two of the mines studied, the reject was 8 and 13 percent of the raw coal from the continuous-mining sections; and 30

** Recovery figures furnished by operator.

TABLE II.—Distribution of 8-hour shift

Mine No.	Time-hours					
	Travel	Lunch	Face	Mechanical delays	Other delays	Productive
1	1.00	(1)	7.00	0.65	1.40	4.95
2	1.00	0.50	6.50	1.00	2.50	3.00
3	1.25	.50	6.25	.70	1.25	4.30
4	.67	.50	6.83	1.50	.50	4.83
5	.50	(1)	7.50	.28	2.52	4.70
6	1.33	.50	6.17	1.00	.17	5.00
7	1.67	.50	5.83	.83	1.80	3.20
8	.50	.50	7.00	.67	1.08	5.25
9	2.25	(1)	5.75	.67	2.50	2.58
10	2.00	(1)	6.00	1.00	.50	4.50
11	1.25	(1)	6.75	.50	1.00	5.25
12	1.00	.50	6.50	.83	.17	5.50
13	1.50	.50	6.00	.40	1.93	3.67
14	1.25	.50	6.25	1.00	1.50	3.75
15	1.10	.50	6.40	.32	1.00	5.08
16	.80	.50	6.70	1.10	.50	5.10
17	.33	.50	7.17	1.20	.30	5.67
18	1.00	.50	6.50	1.50	2.00	3.00
19	1.00	.50	6.50	1.00	1.33	4.17
20	1.50	.50	6.00	.67	.33	5.00

[1] No time loss—crew lunch period staggered.

TABLE III—Comparison of performance of continuous mining and mobile loading

Mine No.	Bed thickness mined, inches	Continuous mining		Mobile loading	
		Raw coal—tons		Raw coal—tons	
		Per unit per shift	Per man per shift on unit	Per unit per shift	Per man per shift on unit
9	41	179.9	27.7	90.6	9.7
16	42	101.0	13.5	(1)	(1)
7	42	104.8	17.5	123.8	14.8
11	42	121.0	22.8	89.1	11.1
8	42	139.0	23.6	183.0	15.3
10	43	133.3	22.2	100.0	9.1
5	48	150.0	23.1	(1)	(1)
16	53	105.2	19.1	(1)	(1)
17	54	250.0	38.5	200.0	16.7
1	54	369.2	46.1	190.2	19.0
12	55	180.0	27.7	155.0	15.5
6	57	199.7	30.7	130.0	17.0
20	58	141.7	19.8	141.7	11.8
18	72	565.0	70.6	304.0	25.3
19	73	209.0	29.8	306.0	21.6
13	74	188.5	26.9	(1)	(1)
15	76	210.0	32.3	277.7	17.4
4	84	278.0	61.8	385.0	39.8
2	84	313.6	48.3	(1)	(1)
14	90	206.0	29.4	154.9	14.5
3	102	293.5	48.9	373.0	25.9

[1] No production from mobile-loading units.

TABLE I—Method of face transportation

Mine No.	Sequence of transfer from continuous-mining machine to section haulage	Section haulage
1[1]	Loading machine—surge car—shuttle car	30-inch belt
2	Shuttle car	36-inch belt
3	Surge car—shuttle car	10-ton mine car
4	do	7-ton mine car
5	Shuttle car—shaking conveyor)	30-inch belt
	Portable conveyor)	Do.
6[1]	Loading machine—shuttle car	5½-ton mine car
7	Surge car—shuttle car	30-inch belt
8[1]	Loading machine—shuttle car	Do.
9	Shuttle car	Do.
10	Surge car—shuttle car	Do.
11	do	Do.
12	do	Do.
13[1]	Loading machine—shuttle car	4½-ton mine car
14	Shuttle car	6-ton mine car
15	Surge car—shuttle car	6½-ton mine car
16	Chain conveyor)	26-inch belt
	Shuttle car)	Do.
17	Surge car—shuttle car	30-inch belt
18[1]	Loading machine—shuttle car	5-ton mine car
19[1]	do	5.2-ton mine car
20	Surge car—shuttle car	1.9-ton mine car

[1] Coal deposited on mine floor by continuous-mining machine.

and 20.4 percent, respectively, from the mobile-loading sections. Both mines, widely separated, left top coal in the continuous-mining section to protect the overlying draw slate and used wood crossbars on wood posts as roof supports; whereas no top coal was left in the mobile-loading sections. Probably because of the top coal and the absence of blasting in the continuous-mining sections, fewer falls contaminated the coal, and a cleaner product to the preparation plant was assured.

Roof conditions in sections where pillars were extracted with continuous-mining machines generally were better than in similar areas in the same mines where pillars were extracted by mobile-loading units. Continuous mining lends itself to the concentrated and rapid extraction of pillars (by splitting, open-end, or pocket-and-fender method.) As only one working place is active at one time for each unit operating on a pillar line, better roof control can be maintained to provide safer working conditions than with conventional mining.

(3) *Face haulage.*—Methods of coal loading and transporting coal away from the continuous-mining machine varied in the 20 mines studied and are tabulated in table 1. Shuttle cars were used to transport the coal away from the continuous-mining machine in all of the mines studied. However, two of the mines were operating continuous-mining machines, which loaded directly onto portable or chain conveyors. The maximum tramming distance from the continuous-mining machine to the unloading station was kept to 300 ft or less to reduce delay caused by waiting on the shuttle car return.

In some mines, the coal is deposited on the floor by the mining machine and then loaded into the shuttle cars by a loading machine. This practice provides temporary storage, better clean-up, and allows the mining machine to operate with a minimum of stoppage. Loading into a surge car was the most common practice observed at the mines studied. However, no one method, based on an analysis of productive

TABLE IV—Summary of performance of continuous-mining, mobile-loading, and hand-loading units

		1	2		3	4	5	6
1.	Location of mine	Ala.	Ill.		Ill.	Ill.	Ky.	Ohio
2.	Mechanization of mine ... percent	100	100		100	100	100	100
3.	Total thickness of bed ... inches	54	108		102	102	60	60
4.	Thickness of bed mined ... do.	54	84		102	84	48	57
5.	Number of 8-hour shifts per day	2	2		2	2	2	2
6.	Average daily production, raw coal ... tons	6,712	7,527		5,060	9,800	1,200	2,350
7.	Total number of employees, underground	431	270		266	515	66	188
8.	Total number of employees, surface and underground	521	388		382	700	88	223
9.	Average production per shift per man employed ... tons	12.9	19.4		13.2	14.0	13.6	10.5
10.	Pillars extracted	No	Yes		No	No	Yes	No
11.	Main line haulage	Track	Belt		Track	Track	Belt	Track
12.	Percent recovery[1]	65	90		45	50	90	65
13.	Continuous-mining machine units:							
	a. Type and number	A-6	A-3	C-9	A-1	A-2	A-4	A-1
	b. Unit shifts per day	12	6	18	2	2	8	2
	c. Average daily production, raw coal ... tons	4,430	1,882	5,645	587	556	1,200	399.5
	d. Percent of total production	66	25	75	11.6	5.7	100	17
	e. Average production per unit per shift ... tons	369.2	313.6	313.6	293.5	278	150	199.7
	f. Average number of men per unit per shift	8	6-1/2	6-1/2	6	4-1/2	6-1/2	6-1/2
	g. Man shifts per day	96	39	117	12	9	52	13
	h. Average production per man per shift ... tons	46.1	48.3	48.3	48.9	61.8	23.1	30.7
	i. Average production per man per shift, underground . do.	18.6	27.9	27.9	28.0	23.2	18.2	16.6
	j. Average production per payroll man shift ... do.	14.9	19.4	19.4	17.3	16.1	13.6	13.3
14.	Mobile-loading units:							
	a. Number of units	6	-		6	12	-	8
	b. Unit shifts per day	12	-		12	24	-	15
	c. Average daily production, raw coal ... tons	2,282	-		4,473	9,244	-	1,950.5
	d. Percent of total production	34	-		88.4	94.3	-	83
	e. Average production per unit per shift ... tons	190.2	-		373	385	-	130
	f. Average number of men per unit per shift	10	-		14-1/2	10	-	7-1/2
	g. Man shifts per day	120	-		173	232	-	115
	h. Average production per man per shift ... tons	19.0	-		25.9	39.8	-	17.0
	i. Average production per man per shift, underground . do.	11.8	-		18.3	18.8	-	11.9
	j. Average production per payroll man shift ... do.	10.2	-		12.9	13.9	-	10.1
15.	Hand-loading units:							
	a. Number of units	-	-		-	-	-	-
	b. Unit shifts per day	-	-		-	-	-	-
	c. Average daily production, raw coal ... tons	-	-		-	-	-	-
	d. Percent of total production	-	-		-	-	-	-
	e. Average production per unit per shift ... tons	-	-		-	-	-	-
	f. Average number of men per unit per shift	-	-		-	-	-	-
	g. Man shifts per day	-	-		-	-	-	-
	h. Average production per man per shift ... tons	-	-		-	-	-	-
	i. Average production per man per shift, underground . do.	-	-		-	-	-	-
	j. Average production per payroll man shift ... do.	-	-		-	-	-	-

1/ Recovery figure furnished by company.

2/ Four sections in mine loading into mine cars.

3/ Loading onto chain conveyors.

time, tons per unit, and tons per man on the unit, showed any significant advantage over the others.

(4) *Productive time.* — Productive time (face time less all delays) ranged from 2.58 to 5.67 hours in the 20 mines studied. (See table 2.) Major operating delays resulted from mechanical breakdowns on equipment, work stoppage to permit timbering, haulage interruptions, and moving or maneuvering equipment. In five mines lunch time loss was eliminated by staggering lunch periods of the crew members.

(5) *Comparison of performance of continuous-mining and mobile-loading units.* — Performance of continuous-mining and mobile-loading units at the same mines is compared in table 3. Mines are shown in order by thickness of bed mined. No distinction of performance for mines extracting pillars and mines not extracting pillars was made in this study. Productivity of raw coal per man shift by continuous-mining units was greater than that by mobile-loading units for the same thickness of coal at the same mine. These differences ranged from 2.7 to 45.3 tons of raw coal per man shift.

(6) *Production curves.*—Production data for the two types of mining at the 20 mines studied are shown graphically, for comparative purposes, by plotting tons of raw coal per man per shift in the unit crew against mining thicknesses. (See Fig. 1.) Group-weighted average points were calculated and plotted for groups of mines having nearly the same mining thickness. The curves shown were based on these points. The curve for continuous mining tends to flatten off at 102 in. However, this trend is not conclusive because: (1) Only one mine in this bed-thickness category was included in the study, and (2) continuous-mining machines mining greater bed thicknesses were not available for this study. Probably the same gradual upward trend of the production curve would be maintained in mining bed thicknesses greater than 102 in. if continuous-mining machines were developed to mine greater bed thicknesses. In opening a new mine or in converting an old mining system to

(TABLE IV Continued)

Mine															
7	8	9	10	11	12	13	14	15	16		17	18	19	20	
Pa.	Pa.	Pa.	Pa.	Pa.	Pa.	Pa.	Pa.	Pa.	W. Va.		W. Va.	W. Va.	W. Va.	W. Va.	1.
100	100	80.2	100	100	100	100	100	100	100		100	100	100	100	2.
50	42	41	48	50	69	74	78	86	48 to 59		54	72	85	62	3.
42	42	41	43	42	55	74	90	76	42 to 53		54	72	73	58	4.
3	3	3	3	3	3	3	3	3	3		2	3	3	2	5.
2,857	1,800	4,058	1,500	5,235	1,600	2,828	5,883	8,750	1,111		700	2,609	5,217	1,700	6.
261	106	683	166	650	147	240	525	794	113		37	115	340	204	7.
314	157	843	193	721	175	287	644	1,004	133		55	140	420	228	8.
9.1	11.5	4.8	7.8	7.3	9.1	9.9	9.1	8.7	8.4		12.7	18.6	12.4	7.5	9.
No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	No	No	10.
Track	Belt	Track	Track	Track and belt	Track	Track	Track	Track	Track and belt		Belt	Track	Track	Track	11.
55	63	93	90	91	90	85	85	96	80		-	68 to 92	52	60	12.
															13.
A-2	A-3	B-2	A-3	A-6	A-1	A-5	A-2	A-1	A-2	B-1	A-1	B-1	A-1	A-3	
6	9	6	9	16	2	15	6	2	6	2	2	3	3	6	
628.5	1,251	1,079.4	1,200	1,937	360	2,828	1,236	420	631	202	500	1,696	626	850	
22	69.5	26.6	80	37	22.5	100	21	4.8	56.8	18.2	71.5	65	12	50	
104.8	139	179.9	133.3	121	180	188.5	206	210	105.2	101	250	565	209	141.7	
6	6	6-1/2	6	5-1/3	6-1/2	7	7	7	5-1/2	8	6-1/2	8	7	7-1/6	
36	53	39	54	85	13	105	42	13	33	15	13	24	21	43	
17.5	23.6	27.7	22.2	22.8	27.7	26.9	29.4	32.3	19.1	13.5	38.5	70.6	29.8	19.8	
12.1	19.3	-	10.3	10.5	14.4	11.8	16.2.	16.2	14.0	10.6	22.7	28.3	18.4	9.7	
9.8	12.5	-	8.6	9.2	11.6	9.8	12.2	12.0	11.3	8.8	14.3	22.3	14.2	8.5	
															14.
6	1	8	1	17	3	-	10	15	-		1	1	5	3	
18	3	24	3	37	8	-	30	30	-		1	3	15	6	
2,228.5	549	2,175.1	300	3,298	1,240	-	4,647	8,330	-		200	913	4,591	850	
78	30.5	53.6	20	63	77.5	-	79	95.2	-		28.5	35	88	50	
123.8	183	90.6	100	89.1	155	-	154.9	277.7	-		200	304	306	141.7	
8-1/2	12	9-1/2	11	8	10	-	10-1/2	16	-		12	12	14	12	
151	36	225	33	298	80	-	321	480	-		12	36	213	72	
14.8	15.3	9.7	9.1	11.1	15.5	-	14.5	17.4	-		16.7	25.3	21.6	11.8	
10.7	13.4	-	6.1	7.1	10.2	-	10.3	10.8	-		13.3	16.6	15.0	7.3	
8.9	9.6	-	5.6	6.5	8.6	-	8.5	8.6	-		10.0	14.3	12.2	6.6	
															15.
-	-	2/4	-	-	-	-	-	-	3/3		-	-	-	-	
-	-	4	-	-	-	-	-	-	6		-	-	-	-	
-	-	803.5	-	-	-	-	-	-	278		-	-	-	-	
-	-	19.8	-	-	-	-	-	-	25		-	-	-	-	
-	-	200.9	-	-	-	-	-	-	46.3		-	-	-	-	
-	-	33	-	-	-	-	-	-	7		-	-	-	-	
-	-	132	-	-	-	-	-	-	44		-	-	-	-	
-	-	6.1	-	-	-	-	-	-	6.3		-	-	-	-	
-	-	-	-	-	-	-	-	-	5.7		-	-	-	-	
-	-	-	-	-	-	-	-	-	5.1		-	-	-	-	

continuous mining, it is possible from the curves shown to approximate the tons of raw coal per man shift in unit crews that could be produced for different bed thicknesses.

Future Bright

For the mines described in the report, the studies show that continuous mining is the most productive method of underground mining whether pillars are extracted or not. Cleaning and sizing of the product does not seem to pose any difficult problems for most preparation plants. In fact, in two of the mines studied using continuous-mining and mobile-loading equipment, the reject from continuous mining was 4 and 8 percent and from mobile loading, 10 and 20 percent.

It can be expected that in the next decade, continuous mining will largely supplant the conventional systems of mining now in use. New types of continuous-mining machines, in addition to improved models of the present-type machines, development of continuous systems of coal transportation, roof-control methods that will not interfere with continuous operation, and new mining systems, will be introduced and result in safer and better working conditions and greater productivity per man employed.

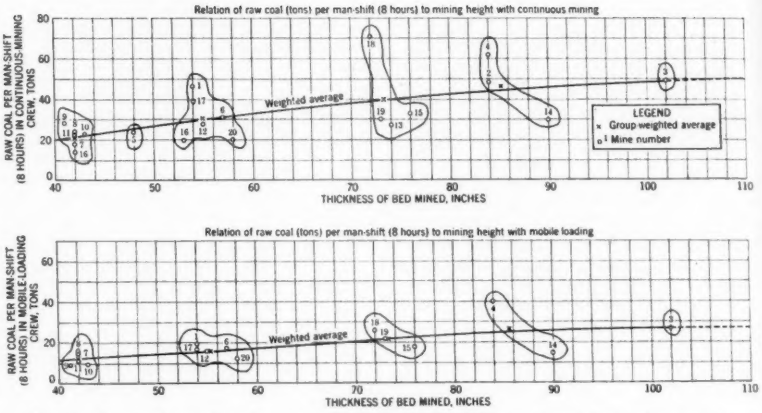

Relation of raw coal (tons) per man-shift (8 hours) to mining height with continuous mining
RAW COAL PER MAN-SHIFT (8 HOURS) IN CONTINUOUS-MINING CREW, TONS
THICKNESS OF BED MINED, INCHES
Weighted average
LEGEND
× Group weighted average
○ Mine number
Relation of raw coal (tons) per man-shift (8 hours) to mining height with mobile loading
RAW COAL PER MAN-SHIFT (8 HOURS) IN MOBILE-LOADING CREW, TONS
THICKNESS OF BED MINED, INCHES
Weighted average

Fig. 1—Comparison of performance of continuous mining and mobile loading at 20 bituminous coal mines

A copy of the complete report, "Mechanical Mining in Some Bituminous Coal Mines, Progress Report 7, Methods of Mining With Continuous-Mining Machines," is available from the U. S. Bureau of Mines. Ask for Information Circular 7696. In the complete report, detailed descriptions are given of each continuous mining operation as in a summary of the performance of conventional units in the mines reported on.

W. Va. Cleaning Plant

(Continued from page 33)

angle turn, thus preventing even feed distribution. Two turning partitions were placed along the flume and a baffle mounted above the screen immediately off the end of the flume. The baffle caused the washed coal to stop and feed evenly to the screen. A steel plate with ¼-in. diam holes was placed at the head end of the screen to absorb wear. This feed arrangement reduced screen wear and permitted complete drainage of the medium. A noticeable decrease in magnetite consumption was observed after this installation.

The clean coal discharges directly to a 36-in. belt collecting conveyor, 86 ft long, inclined up at 15° and handling a maximum of 354 tph at a belt speed of 386 fpm. Belt drippings from the head pulley and return idlers were troublesome. This was eliminated by placing drain pans under the belt for the entire length of the conveyor. Push water is used to sluice the drippings.

Spiral return idlers on this unit also caused considerable trouble. The spiral idlers were construced with two rubber covered steel bars, so designed that they would clean the belt on the return. The rubber covering soon wore, falling off or wrapping around the spiral. After 2704 hours of service, the nine spiral return idlers were replaced with 6-in. rubber disc idlers. All rubber disc idlers were replaced after 4015 hours service with the same idlers. The troughing idlers gave no difficulty, requiring only routine greasing and have been in service 8873 hours, at this writing.

Tail pulley bearings have been replaced three times, the first after 5543 hours service, the second after 1344 hours service, and the last after 1380 hours service. Heavy duty bearings were installed at the last change time. Also the 24-in. diam pulley was replaced.

The original belt was still in service after 8873 hr of operation. Two splices have been made, one of 20 ft at 3398 hr of service and the other of 27 ft after 8065 hr service. Both splices were made to replace damaged sections.

Two weightometers are installed on this unit to determine the weight of washed coal and slack. The first scale is located after the minus ¼-in. unwashed slack has discharged onto the belt. It has proven satisfactory, always checking within reasonable limits. The second is located following the washed coal feed chute to the belt, weighing the slack, drag tank product and washed coal. The weights from this unit are compared with railroad car weights, and inaccuracies ranging from 5 to 20 percent have been found. Adjustment of this unit is possible while running light, but it becomes inaccurate under loads. After exhaustive studies, the manufacturer removed this unit for a factory check-up and recalibration.

A bar conveyor, 30 in. wide, draws the minus ¼-in. coal from two outlets at the bottom of the 100-ton storage bin at a normal rate of 70 tph and a maximum rate of 133 tph. The flights are made of 2½ by 5/16-in. bars and 1½ by 1½ by 1¼-in. angles with 6-in. pitch. The conveyor runs at a speed of 34.5 fpm. Feed regulating gates are mounted on the two outlets of the bins. After 4403 hours of service, both head and tail shaft bearings were replaced with heavier bearings. Except for this replacement, maintenance has been only that of replacing bolts, six flights and routine oiling.

The mixed plus ¼-in. washed coal, minus ¼-in. raw coal, and drag tank product discharges from the belt conveyor by chute into railroad cars. Should there be a railroad car shortage, the coal can be diverted to a 30-in. stacking conveyor, 76 ft long inclined at about 16°, with the discharge end 40 ft above the ground. The entire conveyor unit swings in an arc of 90° permitting stocking at 15,000 tons without further handling. The conveyor belt is designed to handle 415 tph at a belt speed of 520 fpm. The unit, as designed, has been completely trouble free and its operation entirely satisfactory. It is seldom used, since yard storage is held to a minimum.

Look for the
FEBRUARY ISSUE
The Best Annual
Review Ever

Lightweight Aggregates of the West

Eleven Western States Are Principal Source of Wide Variety of Igneous and Sedimentary Materials Used by Construction Industry

By CHAS. W. CHESTERMAN
Associate Mining Geologist
California Dept. of Natural Resources
Division of Mines

MATERIALS in the West, suitable for use as lightweight aggregates, are perlite, pumice, pumicite, volcanic cinders (scoria), expanded clays and shales, and vermiculite. While most of these are used in the natural state, some require processing.

Lightweight materials suitable for use as aggregate can be classified briefly as follows:

(1) Products of explosive volcanic activity—pumice, pumicite, and volcanic cinders.

(2) Products resulting from alteration of pre-existing natural materials —perlite and vermiculite.

(3) Products of sedimentation—shale, clay, diatomite, and diatomaceous shale.

Explosive Volcanic Products

Extensive areas in the West are underlain by Tertiary and Quaternary volcanic rocks, and it is in these areas where virtually all of the lightweight aggregates of volcanic origin are found. Although some pumice has been produced from tuffs and tuffaceous sedimentary rocks, most of the pumice for aggregate has come from mantle or near surface deposits. Pumicite, on the other hand, is produced both from tuff beds interbedded with other sedimentary rocks and from loosely consolidated beds on or near the surface of the ground.

Both pumice and pumicite occur in bed-like deposits. On the basis of mode of accumulation and origin, their deposits may be classified as follows:

(1) Sub-aerial deposits—those deposited on dry land. Characterized by lack of bedding and sorting, and with few large stony fragments.

(2) Sub-aqueous deposits — those deposited in standing water. Characterized by bedding, usually inverted, with interbeds of sand silt and gravel.

(3) Nuee's Ardente deposits—characterized by lack of bedding and sorting as to size. Fragments range in size from impalpable dust to angular boulders as much as six ft in diameter.

(4) Reworked deposits—characterized by graded bedding, cross-bedding, and rounded shape of pumice fragments.

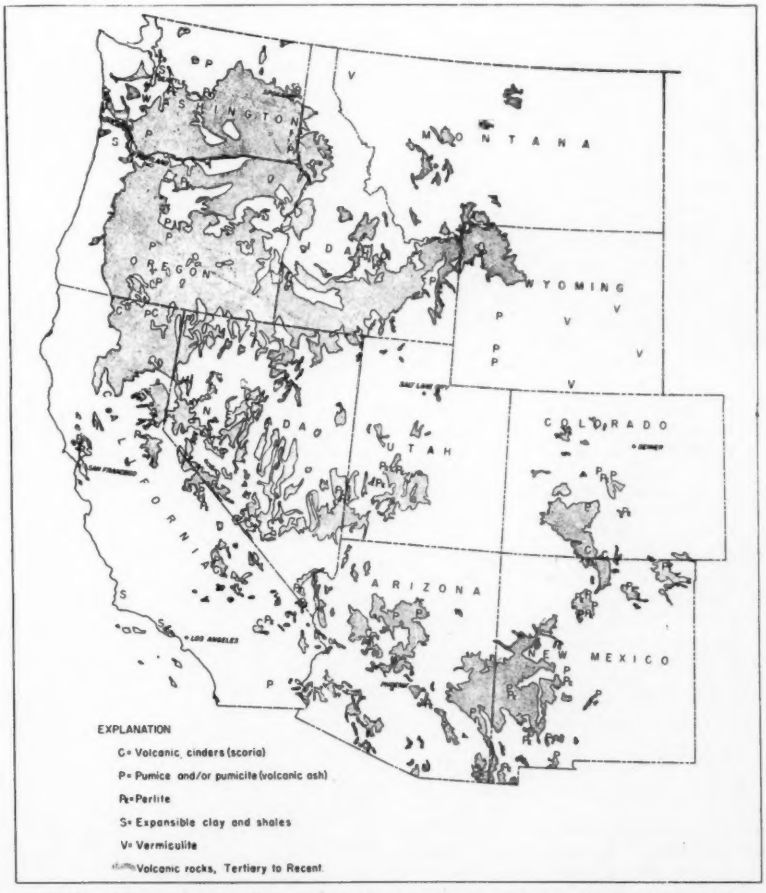
Commercial aggregates have been successfully produced from all four types of deposits.

Volcanic cinders (scoria) are also a product of explosive activity, but unlike pumice and pumicite, they are mined almost entirely from cinder cones built about a central opening or from extensive but less common blanket-like deposits adjacent to fissure-like vents.

Most pumice aggregate is light gray to white in color. The fragments are usually angular, and at most deposits, range in size from 1/16 to six in. in diameter. Crushing and screening is nearly always necessary to produce aggregate from this material.

While some pumices are dacitic and even andesitic in composition, most are rhyolitic. Quite frequently the pumice will include phenocrysts of quartz, feldspar, biotite, hornblende, and even hypersthene. Such crystalline materials have no bad effects on the concrete produced from the pumice.

Pumices in loosely consolidated deposits are easily mined and processed. In the more consolidated and firmly compacted tuffs, especially those which have undergone minor alteration and contain clay, it is necessary to remove



Lightweight aggregates from eleven Western States are used all over the country

the clay and other weathered materials before the pumice is marketable.

Most pumicite is either light gray or white in color. The particles are angular and flat, being cell walls derived from frothy glass. Particles range in size from minus 325 mesh (.0021 in.) to 1/16-in.

Like pumice, pumicites also vary in chemical composition from rhyolitic to andesitic. Most pumicites require very little processing to produce a marketable product. Since a bulk of the pumicite is used as an abrasive in scouring soaps and cleansing compounds, as a filler, and as an insecticide carrier, every effort is made to prepare products of specific sizes. Pumicite used as an aggregate is used in its natural state. If used as a pozzolan, some screening is done in order to produce a size suitable for pozzolanic action.

Volcanic cinders are usually dark in color, ranging from dark reddish-brown to black. They are angular, rough, and range in size from ⅛-in. to several inches in diameter at the deposit. Unlike pumice and pumicite, their range in chemical composition is somewhat limited and usually basaltic. They are crystalline, not glassy, and consist of microcrystalline aggregates of plagioclase and augite with or without a dark basic glass.

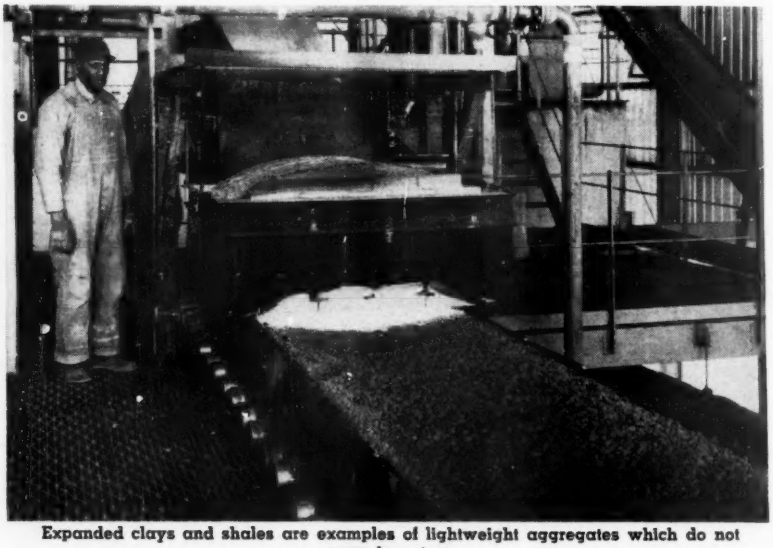
Within the deposit there are volcanic bombs and angular chunks of lava that were expelled with the cinders. The cinders are loosely consolidated and require no elaborate mining methods or machinery.

Alteration Products

Although some perlite deposits are the result of explosive volcanic activity, many of them are the result of the alteration of obsidian or some other form of volcanic glass.

Perlite is a glassy volcanic rock that contains from two to five percent or more water. It is characterized by a small spherical or "onion skin" fracture. The rock in the natural state is not expanded, but when heated rapidly to its softening temperature, it expands or "pops" to a white pumiceous material which weighs from two to 30 lb per cu ft.

Perlite occurs in flows, dikes, sills, plug or stock-like bodies, or as selvages of other small intrusive bodies of rhyolite, dacite, and andesite. Perlite bodies, as a rule, are associated with flows of other volcanic rock or thick accumulations of tuff, tuff breccia, breccia, or agglomerate. Deposits of perlite range in size from small pods measuring only a few feet in width and length to large bodies several tens of feet wide and a thousand feet or more in length. Perlite free from crystals of quartz, biotite, feldspar, hornblende, and stony fragments are desirable, although some perlites containing as much as 15 percent by weight of these crystalline and stony materials are being processed into marketable lightweight aggregates.



Expanded clays and shales are examples of lightweight aggregates which do not occur in nature

Perlite is known to occur in all of the Western states, but the principal producing states are New Mexico, Nevada, California, and Arizona.

Vermiculite is a micaceous material formed by hydrothermal alteration of pre-Cambrian ultrabasic igneous rocks and hornblende-rich gneisses and schists.

Although vermiculite is known to occur in Arizona, California, Colorado, Montana, Nevada, New Mexico, Washington, and Wyoming, the principal producing states are Montana, Colorado, and Wyoming. Vermiculite deposits in Montana are in the Rainy Creek District. The deposits are dike-like in form, at least 200 ft wide and 1000 ft long. Structural conditions of the pre-existing ultrabasic igneous rock and the character of the altering hot solutions determined in large measure the shape and size of the vermiculite deposits. In Colorado vermiculite deposits are widely scattered and occur in pre-Cambrian metamorphic rock where the vermiculite appears to have been formed from the hornblendic rocks. Some of the deposits are in the form of veins while others are very irregular or blanket shaped.

Commercial deposits of vermiculite occur in four districts in Wyoming. The vermiculite deposits are associated with pre-Cambrian igneous and metamorphic rocks and the vermiculite occurs at the contact between granite pegmatites and hornblende-biotite schists, meta-diorite, hornblendite, and serpentinite. The deposits are numerous but have produced only a small amount of vermiculite.

Products of Sedimentation

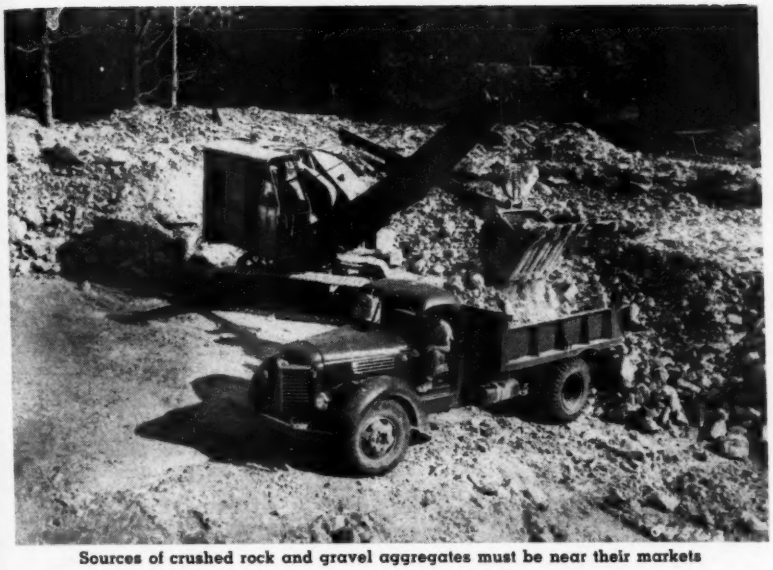
These sedimentary rocks are not usable as aggregate in their natural state. In order to be of value as aggregate, they require crushing, screening, and expanding or bloating. Two processes are in use to prepare expanded clay and shale aggregates: (1) size the material before expansion in such a manner that the expanded or bloated product will have the proper size gradation, or (2) expand the material and then crush and size it to the desired size gradation. Expanded shales and clays are marketed under numerous trade names.

Most of the expanded clay and shale aggregates in the West have been produced from Tertiary sedimentary rocks. Substantial amounts have come also from Jurassic and Cretaceous sedimentary rocks.

Deposits of clay, diatomite, diatomaceous shale and shale are bedded deposits usually associated with other sedimentary rocks. They have a wide range in color from dead white (diatomite) through gray and brown to black. There is also a very wide range in composition. White diatomite usually contains from 85 to 90 percent silica. The bituminous diatomaceous shales, however, contain less silica and much more alumina and organic matter. The clays and shales, on the other hand, contain an abundance of alumina; some organic matter and lime are also present. In addition to variations in silica and alumina, the water content also varies from less than three percent in diatomite to over 10 percent for clays and shales.

Uses and Markets

Although there is some overlap in the use of these various lightweight aggregates, there is a trend toward placing an aggregate into a definite range of usefulness. The greatest amount of overlap seems to be among



Sources of crushed rock and gravel aggregates must be near their markets

the very light aggregates such as perlite, pumice, and vermiculite.

A large part of the expanded perlite is used as plaster aggregate. However, with the discovery of new techniques of expanding perlite, it may be possible to obtain on an economic basis suitable perlite aggregates for load-bearing concretes. Other uses for perlite are (1) insulation, (2) inert filler in paints, rubber goods, and paper goods, (3) polishes, (4) soaps, (5) foundry sand, (6) filters in food processing plants, (7) poultry litter, and (8) oil well drilling muds and acidifying.

Virtually all pumice produced in the West is used as aggregate in making either pre-cast concrete products or monolithic concrete structures. The block-making industry consumes the greatest proportion of aggregate pumice. Block-making plants are situated all over the United States but the source of supply of aggregate pumice is in the Western states. Some pumice is made into aggregate for acoustic plaster while a small amount is used for ground pumice.

Pumicite is used to a considerable extent as an admixture to concrete in dams and various other types of massive concrete structures. In the construction of the Los Angeles aqueduct from Owens Valley, Inyo County, Calif., pumicite was blended with hydraulic cement and produced what was called "Tufa Cement." Pumicite has also been used as an abrasive in scouring soaps and cleansing compounds, in metal polishes, and in electroplating with gold, silver, and nickel. In addition, considerable amounts of pumicite are used as an insecticide carrier for dusting fruit and vegetable crops.

Volcanic cinders have found their greatest use as aggregate in making concrete building blocks. Minor amounts are being prepared especially for stucco.

Aside from a small amount of expanded clay and shale which is used as a pozzolan, a bulk of these materials produced in the West are used as aggregate in making concrete.

Many uses have been developed for vermiculite. It is of no value in its raw state and is calcined or exfoliated before being of any commercial value. Exfoliated or expanded vermiculite is an excellent insulating material and is used in various types of electrical apparatus, ovens, heaters, incubators, pipe covering, refrigerators, and as loose fill insulation in buildings. Vermiculite is also used as an aggregate in making insulating and acoustic plasters.

The most important feature of lightweight aggregates is their light weight, which is due to the high percentage of voids contained in the material. Lightweight aggregates range in weight from six (perlite and vermiculite) to 60 (expanded clays and shales) lb per cubic foot. In addition, the large number of voids in the aggregate are conducive to producing lightweight concretes having good thermal and acoustic properties. On the other hand, the surface texture of most lightweight aggregates is rough, an inherent characteristic of cellular, frothy, and vesicular materials, and for this reason produce harsh-working concretes.

Markets Nationwide

Excepting for clays and shales, virtually all of the lightweight aggregates consumed in the United States are produced from extensive deposits in the West. The principal markets for lightweight aggregates are usually the metropolitan areas where most of the domestic and industrial expansion is taking place and where the construction is needed.

Unfortunately, very few of the deposits of lightweight aggregates are near the principal markets. For the most part, they are located in the mountainous and desert regions which are at considerable distances from the markets. Therefore, for most of these materials, transportation and accessibility are important in determining the value of any given deposit.

Nearly all the lightweight aggregates are in direct competition with sand and gravel. However, with restrictions being imposed by re-zoning and urbanization in many of the larger metropolitan districts, it is becoming more difficult to produce and deliver sand and gravel as cheaply as before. It is therefore becoming economic to develop new and more distant sources.

The lightweight aggregate field, as the entire nonmetal field, is in a constant state of change and adjustment brought about by new usages and developments, transportation costs, accessibility, and quality and quantity of raw material.

As construction boomed, demands for concrete aggregates rose in proportion

The Program Committee considered every suggestion for Convention papers and built framework for a strong meeting

Coal Show Program

Committee Meets in Pittsburgh to Select Topics for Convention Sessions in Cleveland Next May

ON Friday, November 5, the National Program Committee for the American Mining Congress' 1955 Coal Convention and Exposition met at the Wm. Penn Hotel in Pittsburgh, Pa. Hugh B. Lee, president, Maumee Collieries and National Program Chairman, presided at the morning and afternoon sessions, where plans for the four-day meeting in Cleveland May 16-19 were discussed. As a result of the Committee's deliberations, the framework was constructed for the ten-session program outlined herewith.

Among the 34 Program Committee members present at the Pittsburgh meeting were mining executives from all major coal producing areas together with representatives of the manufacturers. All phases of strip and deep mining as well as progress in coal preparation were carefully reviewed by subcommittees and by the full committee before the program was accepted.

Topics selected for the program will reflect the intimate familiarity of the committee members with all the newest developments—not only those that have already proven their worth, but also those still in the testing and planning stages. The program, however, will not be just an unveiling of the newest methods and equipment; it will include accounts of how modern mining companies using conventional methods have achieved success in the face of all odds.

Important and interesting as the convention sessions will be, the Exposition of mining and preparation machinery and supplies will also attract mining men from every corner of this country and from foreign

Program Committee

HUGH B. LEE
Chairman
Maumee Collieries Co.

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C. W. BIGLEY, Centrifugal & Mechanical Industries, Inc.
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IRA COEN, Westinghouse Electric Corp.
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DON JOHNSTON, Northern Illinois Coal Corp.
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P. C. MANLEY, Cardox Corp.
WM. C. McCULLOUGH, Roberts & Schaefer Co.
D. L. McELROY, Pittsburgh Consolidation Coal Co.
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W. J. RUDE, American Gas and Electric Service Corp.
F. EARLE SNARR, Chicago, Wilmington & Franklin Coal Co.
V. L. SNOW, Euclid Div., General Motors Corp.
A. V. SPROLES, Pocahontas Fuel Co., Inc.
R. H. SWALLOW, Ayrshire Collieries Corp.
GEORGE O. TARLETON, Consolidation Coal Co. (Ky.)
G. R. WATKINS, U. S. Fuel Co.
C. E. WALKER, Jewell Ridge Coal Corp.
L. J. WALKER, Chicago Pneumatic Tool Co.
E. C. WEICHEL, Hudson Coal Co.
J. WM. WETTER, Rockhill Coal Co.
J. W. WOOMER, J. W. Woomer & Associates
GUY V. WOODY, Allis-Chalmers Manufacturing Co.

Outline of Sessions

MONDAY MORNING
Continuous Mining Session

MONDAY AFTERNOON
Open for Inspection of Exhibits

TUESDAY MORNING
A: Mechanical Mining Session
B: Roof Support Session

TUESDAY AFTERNOON
Strip Mining Session

WEDNESDAY MORNING
A: Haulage and Power Session
B: Management Session

WEDNESDAY AFTERNOON
Strip Mining Session

THURSDAY MORNING
A: Coal Preparation Session
B: Continuous Mining Session

THURSDAY AFTERNOON
Safety Panel Discussion

shores too. As noted above, the sessions have been arranged to allow those attending the Coal Show plenty of time to inspect the exhibits. It is always hard to decide which is the more interesting and significant, the meetings or the displays of mining and preparation equipment and supplies that make up the Exposition. At the 1955 Coal Show, the question will still be difficult to solve, but sufficient time will be allowed to do justice to both.

Plan now to profit by this four-day practical course in the latest and best methods of mining coal and preparing it for the market. Come and learn how the other fellow is cutting costs to meet competition and still make a profit. See the machinery he is using to do it, in the colorful exhibit halls, where everything the manufacturer has to offer the mining industry will be on display.

Each year more metal and industrial mineral miners are coming to the Coal Show. They have found that the equipment and supplies, originally developed for the coal industry have application in their fields too. The American Mining Congress, its Manufacturers Division and its Coal Division extend a cordial invitation to every mining man, no matter what his field, to attend the 1955 Coal Show in the Cleveland Public Auditorium, May 16 to 19.

Cleveland Convention Bureau, 511 Terminal Tower, Cleveland 13, Ohio, will again take care of all hotel reservations. Forms on which to request hotel reservations have been mailed out to the industry. Be sure to fill yours out and mail it promptly.

Processing Uranium Ores

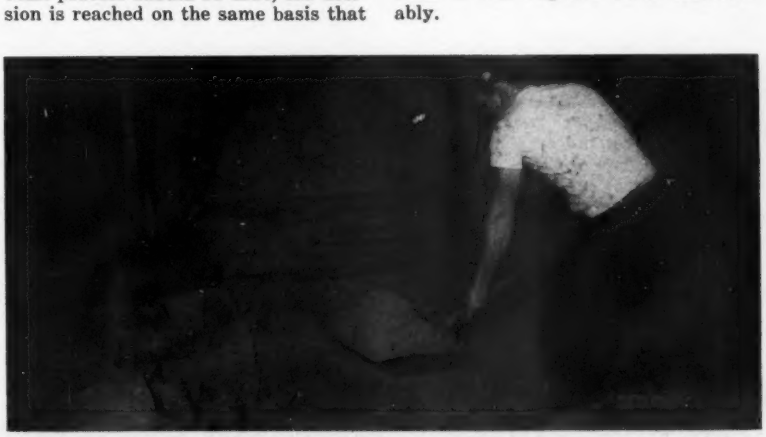
(Continued from page 60)

metallic elements other than sodium and uranium, except in cases where the ore has been salt roasted for vanadium recovery prior to carbonate leaching, in which case a considerable amount of vanadium is dissolved along with the uranium. If sufficient dissolved vanadium is present, the uranium content of the carbonate leach solution can be precipitated as an artificial carnotite, locally known as "yellow cake," by lowering the pH of the solution to a range of 5.5 to 6.5 with sulfuric acid; the carbonate solution is destroyed by the step. Where the ore has sufficient vanadium content to justify salt roasting, the solution remaining after the removal of yellow cake, contains the bulk of the dissolved vanadium and is processed further to precipitate a sodium vanadate, locally known as "red cake," to recover the vanadium. This is done by additions of an oxident, such as sodium chlorate, and further amounts of sulfuric acid. The yellow cake is processed further to remove vanadium, and to improve the U_3O_8 content, by a fusion step which reduces the uranium to a lower valence oxide and permits dissolution of the vanadium by a simple hot water leach. The result is a black uranium oxide which is dried and packaged for shipment.

Where the vanadium content of the carbonate leach solution is low, another method, which does not destroy the carbonate leach solution and permits re-use as a leaching solution after proper regeneration, is employed to precipitate the uranium. Caustic soda is added to the leach solution to precipitate a sodium uranate, which is filtered off, dried and packaged for shipment. The barren leach solution is then regenerated for re-use by either gassing with CO_2 or the addition of sodium bicarbonate.

Conclusion

In comparing any of the methods, or the attendant problems described above, so as to reach a decision as to what process should be used, the decision is reached on the same basis that prevails in the field of other metals—what method gets the best results at the lowest cost? Uranium ore processing, being a relatively new art, the arguments as to what is the best way to do the job are perhaps more varied than is the case with other metals. In the next few years as the new plants, with processes different than those used by the older plants, are built and operated, most of the arguments will be settled by the results that prevail. Although some of the newer processes were developed and encouraged by the Commission, as the uranium mining industry takes them over and uses them it will improve them considerably.



Red cake, sodium vanadate, is shoveled from a washing tank preparatory to further treatment to recover the vanadium

Operators Corner

Why Rubber Lined Pumps?

By A. F. ZIEHM

Application Engineer
Centrifugal Pump Section
Allis-Chalmers Mfg. Co.

HOW is your pump life when handling abrasive, fine mesh material? If it's short, have you ever given thought to a rubber-lined unit? Under certain operating conditions, a gratifying increase in pump life has been experienced by those who have made the changeover.

Experience has shown that rubber-lined pumps can be used to advantage to handle pulps encountered in milling and concentration of ores with abrasive material of minus ⅛ in. to minus 325 mesh.

One definite limitation concerns maximum temperatures of the product handled. With some soft rubber compounds the limit is in the range of 150°-170° F while some special compounds, including hard rubber, have handled material at temperatures up to approximately 200° F.

Pumps manufactured of special steels and work-hardening alloys have been used for years to handle abrasive sands and pulps, but they have been unable to cope with the "washing" action of fine mesh material in suspension. This situation was responsible for the development many years ago of a rubber-lined pump with its lining cemented to the inner surfaces.

It is not unusual to find rubber covered parts which have lasted 10 to 15 times as long as the best hard iron or steel alloys when handling materials with fine mesh particles.

In recent years a special method of pressure molding a soft rubber compound, almost crude in type, to liner and impeller skeletons and at the same time controlling the density throughout was developed. This rubber, as nearly crude as feasible, offered great wear resistance.

Variety of Uses

Today rubber-lined pumps are available for a variety of requirements including handling classifier overflow, thickener underflow, flotation circuits, tailings, concentrates, slurries, etc. The units' head and pump capacity are adjustable to meet a wide range of conditions and the pumps are relatively easy to take down and reassemble when inspection or parts replacement is necessary. They are obtainable with closed or open impeller. The closed-impeller type is preferred for handling thick and relatively coarse pulps for oversize material is not as detrimental to the closed impeller as to the open type, due primarily to its close lip clearance.

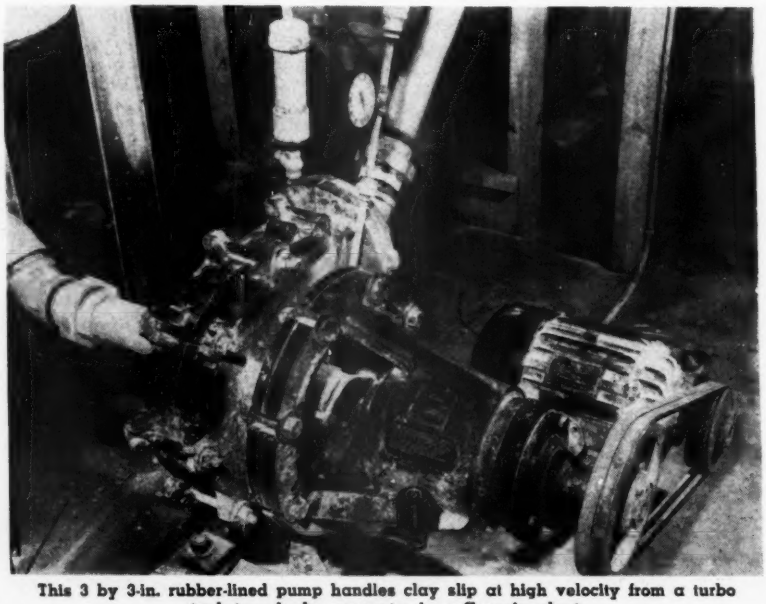
Oil lubricated bearings are of ample capacity in each pump size to take the maximum horsepower for which it was designed. The pump barrel can be re-located to the housing or pedestal by an adjusting screw. This permits control of the position of the impeller in relation to the pump casing, by an axial adjustment. The operator can thus maintain the efficiency and capacity throughout the life of the rubber parts by keeping a proper clearance between the face of the impeller and the suction side liner.

Total dynamic head against which the pump must operate is made up of three parts — static head; friction head, and the kinetic energy imparted to the discharged liquid. Care must be exercised to calculate the total dynamic head as accurately as possible to avoid the possibility of the pump operating at break-off conditions, which would accelerate the rate of cavitation. It would be wise to operate the pump at about the best point of efficiency to insure the best hydraulic balance.

These pumps have fixed impeller diameters so that any variation in head and capacity can be compensated for by changing the diameter of the driven sheaves or V-belt drives.

Friction Factors

The amount of solids that a pump will handle depends largely on suction conditions. If the slurry gets into the eye of the impeller, the pump will discharge it. It is logical to assume that with higher pump speed and slurry consistency the rate of wear on the component parts increases. It is,



This 3 by 3-in. rubber-lined pump handles clay slip at high velocity from a turbo tank to a hydro separator in a Georgia plant

therefore, conclusive that in some cases it would be best to select a larger pump and operate it at a lower speed. This would increase the wear life on the internal parts.

Friction factors involved in the flow of clear water through various sizes of pipes, valves and fittings are well established. The question arises as to what allowances should be made for additional losses in the determination of the friction head to compensate for the viscosities of pulps and other peculiarities inherent in its flow characteristics. There always has been and still is a difference of opinion as to what correction factors should be applied. Too little is known as to what pipe velocities should be to keep solids in suspension depending on the percentage and the specific gravity. We have, however, gained considerable knowledge by experience in handling a variety of different slurries. Each particle size has a definite rate of settling depending upon its shape, gravity and sphere size.

Multiple Stage Pumping

Various rubber-lined pumps have been designed for series operation to meet high dynamic head requirements within a reasonable speed of rotation. Where two stages are required, the second stage pump is built with a high tensile iron casing to stand the combined pressure, but using standard rubber parts. The volute of the first stage pump can be readily re-positioned for top horizontal discharge directly into the suction of the succeeding unit. A supply of clean sealing water at adequate pressure is required. In the event it would be necessary to have more than two pumps to meet head requirements, it would be necessary to space them along the line, dissipating the discharge head of each pump prior to the line's entrance to the subsequent unit.

Although it is desirable to have a positive head on the suction side of the pump, these pumps will operate under a vacuum, with limitations, when necessary, in jobs such as reclaiming tailings from a pond and removing silt from mine sumps.

Certain rubber-lined pumps are designed to facilitate the handling of frothy pulps. The discharge nozzle of these can be rotated to any of five positions—top vertical, top horizontal, top 45° left, top 45° right, and bottom horizontal. In calculating the required capacity of a pump, it is usual to determine the dilution of the pulp and calculate the gallonage from a desired capacity of ore in dry tons per hour. In other words, the volume of solid pulp at the required dilution is determined for a specified tonnage. Some pulps, however, develop a very stable froth which must be pumped. This necessarily increases the calculated volume and due allowance must be made in the pump size and speed selected for the adjusted volume.

If froth or air must be handled by the pump periodically, it is a decided advantage to turn the pump volute for a top horizontal or 45° upward discharge arrangement since this enables the pump to overcome the air or froth and reduces the tendency toward surging.

Planning Pays Off

A sand pump cannot perform satisfactorily unless the installation has been planned with consideration of the hydraulic conditions involved. Suction conditions are important as well as determining the total dynamic head under which it would operate.

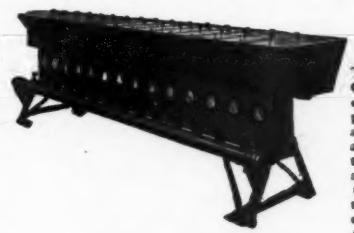
Anyone who has been confronted with the problem of predicting the performance of sand pumps is cognizant of the precise information necessary for the correct application of these units to obtain the best results. Important factors, of course, are the percentage of solids, specific gravity, mesh size, pipe velocities, and dynamic heads under which they must operate.

Don't Discount the Full Yield Possibilities of Your Table Feed

To get the most of high grade concentrates, the cleanest tailings and a minimum of middlings, treat your feed on SuperDuty DIAGONAL DECK Concentrating Tables. By fanning out the pulped feed over more efficient riffling area, cutting is more accurate; concentrates are of higher grade, tailings are leaner and you have a reduced volume of middlings.

This adds up to more yield from new feed and lowered rehandling or recirculating cost, therefore less discounting of feed potential . . . and more profits.

Send for complete data and evidence of results others have achieved with SuperDuty. Ask for Bulletin 118-B.



CONCENCO Type "CPC" Classifier

This all-steel Constriction Plate Classifier is available in 1 to 10 or more cells. Each cell has a pressure chamber at the bottom, a sorting column just above, and a launder section at top. Advantages offered are: (1) Sharp separation, (2) accurate classification, (3) as many spigot products as there are cells, (4) continuous discharge, (5) no moving parts, (6) low maintenance cost.

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Wheels of GOVERNMENT

As Viewed by HARRY L. MOFFETT of the American Mining Congress

PLANS are being readied for the Democratic Party to take over control of the incoming 84th Congress in January. Leading Democrats are not only giving careful consideration to the make-up of the various law-drafting committees but are developing a legislative program to be placed before the Congress early next year. Both parties will strive to sponsor legislation that will please the electorate in 1956, and consequently not much concrete in the way of major laws is expected from the new Congress.

President Eisenhower has met with legislative leaders in both parties with a view to obtaining harmony in the year ahead. Particularly, an attempt is being made to arrive at a bi-partisan foreign policy. On domestic issues the President faces a rocky road and most of his proposals in this field will come in for searching scrutiny by the lawmakers.

Administration officials also are hard at work developing a legislative program to be submitted early in January in the President's State of the Union message.

All in all the new Congress is likely to keep its eyes closely trained on the ballot box.

Mineral Policy

Slightly over a year after the President had formed a Cabinet Committee to develop recommendations for a national mineral policy, that Committee, headed by Interior Secretary McKay, presented eleven suggestions to "foster a full and orderly program for the development and conservation of our national resources."

In reporting to the President, the Secretaries of Interior, State, and Commerce, and the Director of the Office of Defense Mobilization, made the following recommendations designed to "encourage an orderly but vigorous development of domestic mineral resources":

1. A complete review of all stockpile objectives for strategic and critical metals and minerals and the establishment of new long-term objectives that will assure, over a period of time, the acquisition of adequate stocks and thereby reduce or eliminate foreseeable wartime shortages.

2. The supply-demand situation for each metal and mineral be evaluated periodically, on a case-by-case basis, to establish the level of efficient domestic production required for mobilization.

3. Establishment of adequate mobilization planning for metals and minerals.

4. Periodic review of the tax structure as it affects the discovery and production of minerals in order to eliminate, where possible, deterrents to the sound development of the nation's mineral resources.

5. Financial assistance for exploration by the Government be continued and strengthened.

6. The Department of Interior to speed up its topographic and geologic mapping and accelerate geologic research and development of geochemical and geophysical theories and techniques.

7. The Department of Interior to expand direct mineral exploration activities but only when it is clearly in the national interest and it is reasonably certain that the work will not be done by private industry.

8. The Secretary of Interior to prepare recommendations for revision of the mining laws to recognize and encourage the use of newer methods of exploration.

9. The Interior Department to intensify its program of mineral and metal research aimed at development of latent resources, new materials, and improved utilization of raw materials.

10. The Secretary of Interior to strengthen and coordinate collection and dissemination of facts concerning mineral production and utilization.

11. The Secretary of Interior to establish and maintain, through some workable body, the contacts between the mining industry and the Government to give force and effect to these policy recommendations.

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Washington Highlights

MINERAL POLICY: Announced
MOBILIZATION: Mining activities transferred to Interior
COAL: Recommendations to Cabinet
EQUIPMENT MANUFACTURERS: Meet with Commerce Department
TARIFF ACT: 3-year extension likely
TAXES: Regulations next Spring
STOCKPILING: ODM reports status

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The Cabinet Committee said that legislation may be required to implement recommendations 4 and 8, but that adequate authority exists to carry out the remainder of the policy suggestions.

In its report, the Cabinet Committee stressed that the Government has an obligation to assure that the mineral resources of the nation be developed, conserved and utilized in the best possible manner over the longest possible period in order to enhance its security and commerce. It pointed out that development of mineral resources is the function of private enterprise but that the Government must continue to assist in many ways.

Mining and Mobilization

As a first step in the Government's move to centralize responsibility for mining industry matters in one Government agency, the Office of Defense Mobilization has delegated to the Interior Department authority to develop preparedness measures for defense mobilization for solid fuels, petroleum and gas, electric power, and metals and minerals.

ODM directed the Secretary of Interior to: (1) handle priorities and allocations dealing with the above named industries; (2) collect and evaluate data as to the productive capacity and supply of metals and minerals under partial or complete mobilization; (3) set goals, including financial aid programs, for expansion

programs for overcoming shortages of metals and minerals; (4) recommend to ODM necessary programs to achieve an adequate mobilization base; (5) develop and administer mineral and metal exploration and expansion programs; (6) handle recommendations for accelerated tax amortization for mining facilities and make recommendations to ODM for loans, guarantees and procurement contracts for metals and minerals; and (7) assist ODM in formulating plans for the stockpiling of strategic and critical materials and in the acquisition of such materials and expansion of domestic sources of supply.

Coal Industry Reports

A report on the major problems facing the domestic fuel industries has been submitted to the Cabinet Committee on Energy Supplies and Resources Policy by a task force which has developed policy suggestions for overcoming these problems. The Cabinet Committee is expected to meet shortly to consider the report and to draft its recommendations to President Eisenhower. Interior Secretary McKay has expressed hope that the final report to the President will include recommendations that will form the basis for a national policy for energy supplies and resources.

It is understood that the industry task committee's report to the Cabinet Committee calls for action with respect to taxes, residual oil imports, natural gas regulation, Government fuel procurement, less discriminatory freight rate structures, and foreign outlets for coal. Many of these recommendations, if approved by the President, can be put into effect through the Executive Department; others will require Congressional sanction.

Meanwhile, plans are afoot for the holding of a meeting, under the auspices of the Governors' Fuel Conference, of Senators and Congressmen from 16 leading coal producing states. Major purpose of this meeting is to reach an agreement on a legislative program for the coal industry which can be supported by this Congressional group.

The Foreign Operations Administration's coal export program begins to make some headway. Four bids have been accepted for shipment of U. S. coal to Korea and negotiations are under way for coal shipments to Greece, Yugoslavia, and Indo-China.

Mining Equipment Meeting

Representatives of the mining machinery manufacturing industry and the American Mining Congress met with officials of the Department of Commerce last month to discuss the operations of the Business and Defense Services Administration, policies of the Export-Import Bank, and studies of Cabinet Committees on fuels and the mineral industries. They also considered the role that the mining equipment industry would be called upon to play in any future mobilization.

For the most part the meeting centered about an explanation of the activities of the Commerce Department on behalf of industry, including the operation of the defense materials system.

Spokesmen for the manufacturing industry called the attention of the Government officials to the need for establishing an independent and integrated mining division, to handle the problems of the mining equipment manufacturers and the mines in any future national mobilization. They also urged tariff and tax relief for domestic mining industries harmed by foreign imports.

Tariff Act Extension

White House spokesmen have disclosed that a three-year renewal request for the Trade Agreements Act will be sent the new Congress by the President early in January. This announcement spiked recent conjectures that the President might seek a five-year renewal of the trade agreements authority.

Washington observers generally predict that the President will receive approval of this request although there are likely to be determined drives made to place tariff restrictions upon a number of commodities hard hit by foreign imports.

Meanwhile, the Treasury Department has determined that some sales of East German potash in the United States have been made at less than fair value, and has forwarded its findings to the Tariff Commission to ascertain if these sales have injured or threatened to injure domestic industry. If the Commission finds that the foreign potash has threatened injury to or injured domestic producers, the Government can impose duties to make up the difference between the price at which the imports were sold in the U. S. and the foreign market value. Six domestic companies had complained that foreign potash was being dumped into the U. S. market.

Tax Regulations

The Internal Revenue Service is developing regulations under the revised Internal Revenue Code. The bulk of these new regulations will not be available in final form until next Spring.

The Revenue Service has also announced that it is relaxing its "no-interim-guidance" policy on tax rulings under the 1954 Revenue Code. The new policy eases restrictions put into effect last August whereby no interim rulings would be announced in advance of publication of the regulations.

Two types of rulings will be issued under the new policy: (1) if the statute provides a clear answer a ruling will be given under normal procedure; (2) in situations where there is doubt under the terms of the statute, "business emergency" and "unusual hardship" cases may obtain rulings "if the doubt may reasonably be resolved prior to the issuance of the regulations." In some cases IRS may issue "conditional rulings" which may not be binding on the service in the event the regulations when finally issued are in conflict with the conditional conclusion.

Stockpiling Goals

The Joint Senate-House Committee on Defense Production has reported that the industrial mobilization which started after fighting began in Korea is "now a long way toward achievement."

"The huge industrial expansion during the last four years," the Committee said, "has been aimed at overcoming shortages so vital to our defense economy. Adding new capacity can be futile, however, unless the mobilization base, built at great cost, is maintained in the maximum possible state of readiness."

The Committee stated that the stockpiling program has established minimum stockpiling objectives for 75 strategic materials with a market value of nearly $6.8 billion. It reported that stockpiling objectives have been reached in 30 materials, with only 18 materials at less than 50 percent of established goals. The Committee listed nickel, tantalum, selenium, titanium and strategic mica as the scarcest of the critical materials, with titanium as the largest incomplete program in terms of dollars.

Meanwhile, the Office of Defense Mobilization has announced that the authority relative to purchasing or contracting for the acquisition of materials for a supplemental stockpile has been delegated to the General Services Administration.

Gold, Gold, Gold! We want URANIUM —not Gold!

AMC Personals

Frank Coolbaugh, vice-president—Western Operations of Climax Molybdenum Co., was elected president and a director of Climax Uranium Co., November 4. He replaces **John H. White, Jr.,** who has resigned.

Coolbaugh is now in charge of all mining, milling, and exploration operations of both Climax Molydenum and of its associated companies. Climax Uranium is engaged in mining operations on the Colorado Plateau and has a mill at Grand Junction.

Frank Coolbaugh

Except for service during World War II, Coolbaugh has been with Climax since shortly after his graduation from the Colorado School of Mines in 1933. He became resident manager of the molybdenum operation at Climax, Colo., in early 1952, was promoted to general manager in charge of Western Operations in December 1953 and was elected a vice-president of Climax in April 1954.

Ellwood B. Nelson has been made chief engineer of raw materials for the Tennessee Coal & Iron Division of U. S. Steel Corp. Succeeding Nelson as general superintendent of coal mines is **James G. Grevling, Sr.,** who previously held the position of assistant general superintendent of ore mines and quarries.

Sheldon P. Wimpfen, manager of the Grand Junction Operations Office of the Atomic Energy Commission and former editor of MINING CONGRESS JOURNAL was designated the "outstanding ex-student for 1954" by Texas Western College of the University of Texas. When Wimpfen was graduated in 1934 the institution was known as the College of Mines and Metallurgy of the University of Texas.

Joseph A. Martin has been elected president of the Pennsylvania Coal Co., succeeding **Ralph A. Lambert,** who resigned following a leave of absence occasioned by ill health. Martin has been associated with the anthracite producing company since 1919, when he entered its service as a supply clerk at No. 9 Colliery. His most recent position was that of vice-president and comptroller. The company operates two collieries near Scranton, Pa.

Victor Chemical Works has reassigned three of its key operating men. **Roy E. Paul,** supervisor of Montana activities, has returned to Tarpon Springs, Fla., to resume duties as assistant to Floyd B. McCoy, general superintendent of furnace plants. **LaVern O. Streitmatter,** production assistant to Paul, becomes superintendent of Victor's Montana plant at Silver Bow, and **Clarence G. Derick, Jr.,** has been promoted to project engineer of the phosphate rock mining operations of the company in Montana.

C. M. Hoard has been appointed division superintendent of the Marion Division, Bethlehem Mine, succeeding the late W. E. Hall. Office of the Marion Division is at Barrackville, W. Va. **Charles K. Dunlap** succeeds to Hoard's former position as superintendent of the Barrackville mine.

Directors of Callahan Consolidated Mines, Inc., have named **George Grismer** president succeeding Dr. T. R. Mason who resigned. **H. F. Magnuson,** who has been secretary-treasurer of the firm for several years was appointed a director to fill the vacancy created by the resignation.

Harry A. Quenon, division manager for Eastern Gas & Fuel Associates, has been succeeded by **R. C. Luther,** vice-president of Peerless Coal & Coke Co. as president of West Virginia Coal Mining Institute.

J. C. Landenberger, Jr., has been named general superintendent of operations, Kennecott Copper Corp., Utah Copper Division. He is succeeded as general superintendent of mines by **V. S. Barlow. Ernest C. Simpkins** replaces Barlow as superintendent of mines, while **J. A. Norden,** general mine foreman, has been named assistant mine superintendent. Norden was formerly director of labor relations and has been succeeded in that position by **D. O. Olsen.**

Guy N. Haynes has been appointed preparation engineer for the Pocahontas Fuel Co., Pocahontas, Va., succeeding **J. W. Forman.** Forman has resigned the position which he has held since September 1949 to become service and preparation engineer for the Fairmont Machinery Co. of Fairmont, W. Va.

Haynes has been superintendent of the preparation plant at the company's Itmann Mine since January 1952. Prior to that time, he had been tipple foreman at Itmann for two years.

Three major personnel promotions have been made by American Potash & Chemical Corp. as a part of the company's current development and expansion program, it has been announced by Peter Colefax, president of the company.

George S. Wheaton, formerly assistant vice-president of the company's Eston Chemicals Division at Los Angeles, has been promoted to vice-president in charge of that division.

Thomas F. Edson, formerly assistant vice-president of research and development, is promoted to a newly-created position of vice-president in charge of special engineering projects.

Richard J. Hefler, secretary of the company, goes into a newly-created position as assistant to the president. He will also continue his duties as secretary.

Frank V. Hicks retired November 30 as general superintendent of coal mines and quarries for U. S. Steel's Columbia-Geneva Steel Division at Dragerton, Utah.

In 1919 Hicks entered coal mining. His first job in the industry was with a Union Pacific Coal Co. property in Centralia, Wash. Five years later he was transferred to another property of the company in Wyoming, starting as an engineer and rising through a succession of jobs to the superintendency of the mines.

In 1942 Hicks joined a Chicago consulting firm which was developing the Geneva Mine near Dragerton for the government. As soon as the mine started production of coal for Geneva Works, then operated by United States Steel Corp. for the government, he became its superintendent. Geneva Works was purchased by U. S. Steel in 1946, and Hicks remained with the corporation. In January 1946, he was appointed superintendent of mines and quarries for Columbia-Geneva Steel Division in Utah.

R. E. Durland has been appointed assistant plant chemist by Calaveras Cement Co. at San Andreas, Calif. Before his appointment, Durland had served as plant superintendent for Southwest Potash Corp. at Carlsbad, N. M.

A. R. Powell, who has been associate manager of the central Research Department of Koppers Co., Inc., since 1949, has been named acting manager of that department following the resignation of **G. F. D'Alelio.**

A leading scientist in coal chemical technology, Powell will coordinate research activities of Koppers six operating divisions and assume responsibility for operations at the company's laboratories at Verona, Pa., and for coordination of company - sponsored fellowships in various national research institutions and universities.

Ralph I. Clark, formerly with the San Luis Mining Co., Tayoltita, Durango, Mexico, is now mining geologist in the Pacific Northwest area for Gladding, McBean & Co., Seattle.

According to a recent announcement, the Kentucky Mining Institute has elected **S. A. Fox,** Blue Diamond Coal Co., Middlesboro, Ky., as president to succeed G. O. Tarleton.

H. E. Knight has been elected first vice-president; **F. F. Stewart,** second vice-president; **E. F. Milen,** third vice-president and **A. D. Sisk,** secretary-treasurer.

L. W. Swent was recently named administrative assistant to A. H. Shoemaker, general manager, Homestake Mining Co., at Lead, S. D. Swent had been assistant general manager of San Luis Mining Co.

George W. Dove has retired as superintendent of Alpoca mine of Gaston Coal Co. in Wyoming County, W. Va.

Philip F. Beaudin, senior vice-president of Copper Range Co., resigned recently as a director and will retire as vice-president on December 31, 1954, after 50 years of service in the mining industry.

Beaudin has been associated with Copper Range and affiliated interests in an executive capacity since 1930. Previous to his transfer to Boston, he was vice-president and general manager of East Butte Copper Mining Co. and affiliated interests in Montana, Colorado, Nevada and Wyoming, with executive offices in Boston, and general offices in Butte, Mont., where he resided for 25 years.

Sunnyhill Coal Co., producers and wholesalers of coal with general offices in Columbus, Ohio, has increased its board of directors from five to seven members. **H. Gerrit Ward** and **Alvin G. Keller** are the two new directors.

— *Obituaries* —

Edmund J. Longyear, age 80, founder of the E. J. Longyear Co., died recently in California. Mr. Longyear played a predominant part in the early stages of the development of the iron ores of the Mesabi range, Minn. He superintended the first diamond drilling on the Mesabi Range in 1890.

Mr. Longyear is remembered as a man of highest professional standards and integrity.

George W. Minns, 58, assistant to the general manager of the Crozer Coal & Land Co., Wyoming County, W. Va., died October 24 in Huntington, W. Va.

Earl Jameson, 57, Harlan County, Ky., coal operator, died October 1. Mr. Jameson had been in the coal business in that area since 1919.

Swain Joseph Swainson, 53, for many years director of American Cyanamid Company's Mineral Dressing Laboratories at Stamford, Conn., died October 22 at Southold, Long Island after a prolonged illness.

Mr. Swainson had been associated with the mining industry all his life and was internationally known as an outstanding figure in the field of mineral dressing. His work took him to mining centers all over the world.

Born in Mountain, N. D., Mr. Swainson was a graduate of the University of North Dakota and the University of Utah. Of particular significance was his work on improvements in froth flotation and heavy media separation.

For several years, Mr. Swainson supervised the operations of the Atomic Energy Commission's research laboratories in Winchester, Mass.

Alex M. McDonald, 53, in charge of geological exploration for the Anaconda Copper Mining Co. in the western United States, died October 27 in Salt Lake City.

A native of Butte, Mont., Mr. McDonald was widely known in mining circles of the country. He went to work in the Geology Department of the Anaconda Copper Mining Co. in 1922 directly from college. In 1929 he became associated with North Butte Co. of Butte, Mont. and in 1931 returned to Anaconda. In 1935 he was named mine foreman of the Mayflower Mine at Whitehall. Following a period as project director for the Works Progress Administration, Mr. McDonald, in 1942, was assigned the program of exploration and development of Anaconda's early operations in Yerington, Nev. In 1945 he was placed in charge of all outside exploratory work for the company in the western United States.

William W. Sloane, vice-president in charge of engineering, Goodman Manufacturing Co. died September 8. Mr. Sloane had been with Goodman in an engineering capacity since 1911. After serving as assistant chief engineer for many years, he was appointed chief engineer in 1937 and vice - president in 1945. He was responsible for many of the progressive machine designs successful in promoting the mechanization of underground mining operations and he enjoyed wide recognition for his exceptional contributions to both engineering and mining fields.

Mack C. Lake, internationally-known mining engineer and geologist and former president of U. S. Steel Corp.'s Orinoco Mining Co. died November 9 following a lengthy illness.

Mr. Lake joined the M. A. Hanna organization at Duluth, Minn., as a geologist in connection with its operations in the Lake Superior district in 1915. His responsibilities with the company were later expanded to cover operations and investigations relating to coal, manganese, copper and other minerals. He joined U. S. Steel in 1945.

Exploration under his direction led to the discovery in 1947 of the iron ore deposits at Cerro Bolivar in the remote interior of Venezuela. In 1949, Mr. Lake was appointed president of the Orinoco Mining Co. when that U. S. steel subsidiary was formed. He retired in January of this year, but was retained by the corporation as a consultant on special assignments in the engineering and raw materials department. During the past several years, Mr. Lake was also closely associated with the M. A. Hanna Co.'s Labrador iron ore exploration.

Titanium from Maryland

Titanium Ores Corp. has announced that commercial production of titanium ore will be undertaken at Cove Point, Md., south of Calvert Cliffs by the end of this year. Equipment is being installed at the Chesapeake Bay site, where the sands will be processed and titanium ores separated.

Penn-Dixie Expands

Penn-Dixie Cement Corp. has acquired the Petoskey Portland Cement Co. and the Petoskey Transportation Co. of Petoskey, Mich., according to a recent announcemeent. The acquisition will add approximately 1,600,000 bbl of cement annually to Penn-Dixie's present output of 11,300,000 bbl.

According to the announcement, a plant modernization and expansion program will be started immediately. It will include the installation of new crushing equipment, cooler and other installations in the quarries of the Michigan companies which will now operate under the Penn-Dixie name.

Big Pig

A 770-lb Hampshire boar raised on reclaimed stripped land by Meadowlark Farms, Inc., farm agent for Ayrshire Collieries Corp., took first prize for senior yearling Hampshire boar at Indiana's 1954 State fair.

Meadowlark's reclaimed-land-raised hogs also placed high in other competitions during the fair. The Meadowlark boar was the senior yearling reserve champion, a pen of Meadowlark barrows was acclaimed reserve champion among all breeds. In the class of senior boar pig, the Meadowlark entrant was placed third out of a class of 65 prize hogs from the midwest. In junior boar pig, Meadowlark placed second out of a class of 60.

Ayrshire Collieries Corp. operates strip mines in Indiana, and through two affiliates, Delta Collieries Corp. and Fairview Collieries Corp., in Illinois. Meadowlark Farms, Inc., is a subsidiary organized to reclaim and manage the farming of stripped lands.

Breaks Cargo Record

The *George M. Humphrey*, the newest iron ore carrier on the Great Lakes, set a new cargo record for the Great Lakes when it loaded 21,762 tons of iron ore at Allouez, Wis., October 14, on its maiden voyage. On subsequent trips, the *Humphrey* loaded 22,379 tons on October 21, to break its own record; 21,173 on October 26, and 21,109 on November 1.

Republic Acquires Coal Mines

Republic Steel Corp. recently acquired the coal mining properties of Ford Collieries Co. near Pittsburgh, Pa. Two mines, the Francis and Berry, neither of which has been worked for over a year and a half, figured in the deal. Both properties adjoin Republic's Russellton mine and plans call for Republic to expand Russellton operations into the new property. Coal will be hoisted through the Russellton shaft and processed through the Russellton coal washing plant.

Choose Knoxville

Knoxville, Tenn., will pay host to the 1955 National First Aid and Mine Rescue Contest next October. J. J. Forbes, Director, U. S. Bureau of Mines, will announce the exact date later.

Knoxville was chosen for the meet although at least three other cities were considered. The 1954 contest was held in Fort Wayne.

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Honor First Talc Plant

A large bronze plaque memorial was recently dedicated to the first talc plant in the United States. Robert H. McCarthy, president, International Talc Co., Inc., made the presentation in ceremonies at the approximate plant site between Fowler and Balmat, N. Y.

The plaque states that "near this point was erected the first mill in the United States to grind talc on a commercial basis." It was built by Agalite Fibre Co. in 1876.

Coal for Atoms

The Yankeetown dock facilities, near Evansville, Ill., were dedicated November 6 and small lots of coal are now being handled for the big electric plant at Madison, Ind. The plant is one of three which will supply the atomic energy plant at Portsmouth, Ohio, with needed electricity.

Coal handled at the Yankeetown dock is mined by Wright Mines of the Boonville Collieries Corp. and Victoria Mine of the Victoria Coal Corp. These two southern Indiana producers will supply 2,000,000 tons of coal a year by strip mining.

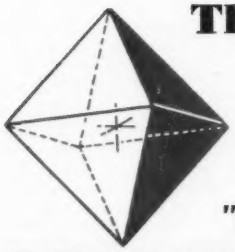
Sell Peerless Houses

One hundred seventy-five houses in the McDowell County, W. Va., mining community of Peerless owned by Peerless Coal & Coke Co. have been sold to a group of Welch, W. Va. men. All of the property acquired will be placed on the market, with first preference being given to present occupants.

New Olga Plant

The 14,000 tpd coal preparation plant of the Olga Coal Co. has been put into operation. Coal from the Olga No. 1 and 2 mines at Coalwood and Caretta, W. Va., respectively, will be cleaned at the new plant. While the underground workings of these two mines are adjacent to each other, the output in previous years has been hoisted at separate shafts and has been prepared and loaded at separate cleaning plants. Now coal from both mines is hauled underground to the shaft at Caretta for hoisting to the surface in 15-ton capacity aluminum skips.

The plant has a designed capacity of 925 tph. There are three complete and individual Nelson L. Davis heavy density cleaning units in the plant, all of which have the same size coal and are of equal capacity. Coal is hoisted three shifts per day. As a rule, hoisting is done only a few hours on the third shift. The preparation plant operates two shifts a day. However, coal is processed only part of the second shift leaving several hours for cleaning and maintenance by the operating crews.



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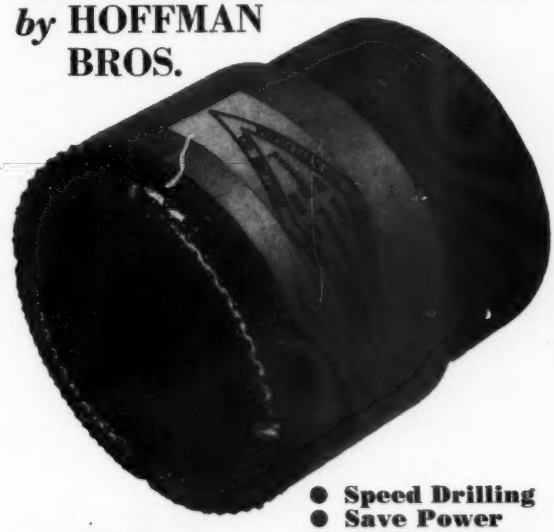

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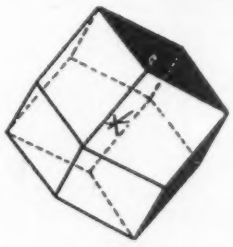

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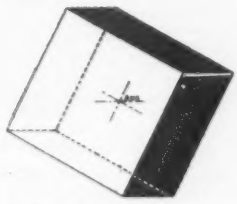

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Ohio Deep Mine

One of the few deep mines in Meigs County, Ohio, owned and operated by Orville Hogue was completed October 23, and is now in production. It was dedicated October 3 with a picnic sponsored by the owner.

Universal Atlas Expansion

Plans for construction of a new plant having an annual capacity of more than 3,000,000 bbl of cement have been announced by Charles B. Baker, president of Universal Atlas Cement Co. The new plant is to be the largest single production unit to be constructed in the cement industry during the past 15 years. It will be located adjacent to this U. S. Steel subsidiary's Buffington plant at Gary, Ind. When this addition is completed the over-all Buffington operation will have a total capacity of more than 10,000,000 bbl of cement per year.

In addition, Baker announced plans for an associated project consisting of a clinker grinding plant and related facilities at Milwaukee, Wis. Completion of this project will establish the first cement-producing plant at that location and will more than double the cement now available through the company's present bulk and package plant there. Cement clinker will be shipped by lake from Buffington to Milwaukee and there ground into finished cement on a year-round basis. This will eliminate barge shipments of cement from Buffington to Milwaukee which were limited to about eight months of the year by winter conditions on Lake Michigan.

Preliminary plans call for completion and production in late 1956.

Traditionally, one of the most important markets served by the Universal Atlas Cement Co. has been the heavily populated and high cement-consuming territories adjacent to its Buffington plant and Milwaukee distributing station. The current toll road and expanded State highway plans of Illinois, Indiana, Wisconsin and Michigan, as well as the new national highway program, assure increasing demand for cement and concrete; as will the accompanying growth of home, commercial, industrial and governmental building that follows in the path of new highway construction.

It is interesting to note that U. S. Steel made its first venture into cement-manufacturing in the Chicago area. Illinois Steel Co., one of the original units of U. S. Steel, first produced cement at its old North Works in Chicago in 1895 and at its South Works in 1900. Cement was first made at Buffington in 1904. Additional capacity was added there and production was started in 1907, followed by yet another additional plant which went into production in 1911 and which currently produces over 7,000,000 bbl of cement annually.

The present storage and packing plant at Milwaukee was built in 1930. The new clinker grinding plant will not only more than double the amount of cement available for shipment from Milwaukee, but will also provide for expanded trucking facilities to serve customers within this high demand area. The additional production at the Buffington plant will also permit the cement company to serve better the areas supplied through its other packing plant at Green Bay, Wis., and Muskegon, Mich.

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APPLICATIONS are invited for appointment to the post of Professor in Mining Engineering who will be head of the Department of Mining.

The substantive salary attached to the post will be as arranged between the successful applicant and the University, but will not be less than £3,000 per annum. In addition, a married man will receive cost of living allowance at such rate as may be authorized from time to time, the present rate being £234 per annum.

Membership of the University Institutions Provident Fund is compulsory and involves a contribution of 7% of the pensionable salary, the Government and the University together contributing an equal amount.

The pensionable salary is at present £1,600 per annum. Membership of the University's Staff Medical Aid Fund is also compulsory in the case of an officer who is eligible for such membership, and contribution will be in accordance with the rules of the Fund.

The Professor will be called upon as part of his duties to serve as a Consultant to the Transvaal and Orange Free State Chamber of Mines. He will not, except under special circumstances, be granted permission to engage in private consultative work.

Duties are to be assumed on the 1st July, 1955, or as soon as possible thereafter. Applicants are advised to obtain the information sheet giving more details in regard to this vacancy from the Registrar, University, Milner Park, Johannesburg, South Africa, with whom Applications should be lodged not later than 31st January, 1955.

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Tennessee Safety Day

The 1954 annual Tennessee Mineral Industries Safety Day, held September 25 at Chilhowee Park, Knoxville, Tenn., included 11 first-aid teams and three mine rescue teams in this State-wide contest for the coal and metal mining industries. First place in the Coal Mining Division of the first-aid contest was won by the team representing the Southern Collieries mine, Southern Collieries, Inc., co-sponsored by U.M.W. of A. Local Union No. 3164, also winner of the 1953 contest; second and third places went to the Eagan mine, Blue Diamond Coal Company, U.M.W. of A. Local Union No. 5848 and the Fork Ridge mine of the same company, U.M.W. of A. Local Union No. 1578, respectively.

In the Metal Mining Division, first place was won by the Mascot mine, American Zinc Co. first-aid team. Second and third places were won by the Tennessee Copper Co. mines.

The mine rescue contest was won by the Anthras mine, New Jellico Coal Co., closely followed by the Mascot team, American Zinc Co. and the Reels Cove No. 2 mine, Tennessee Products and Chemical Corp.

The grand prize for the top first aid and mine rescue teams co-sponsored by a Company and Local Union was won by the Mascot mine teams, American Zinc Co. and Local Union No. 400, Gas, Coke and Chemical Workers. Loving cups and other trophies were presented the mining teams by Tennessee Commissioner of Labor William Parham, in the absence of Governor Frank Clement who made the 1953 presentations.

Mascot's Mine Reserve Team placed second in the mine rescue contest

Included in the day's program were a family recreation and fun hour and special concessions throughout the park for the miners' families. A concert by the Tepco Band, Tennessee Products and Chemical Corp., and a pole-top artificial resuscitation demonstration by employes of the Power Division, Tennessee Valley Authority, added to the interest of the audience in the indoors arenas.

Safety Day was sponsored by the Tennessee Division of Mines, Southern Appalachian Coal Operators Association, the United States Bureau of Mines, the United Mine Workers of America, and the city of Knoxville.

Fight Roof Fall Fatalities

The bituminous coal industry has launched an intensive safety campaign aimed at reduction of fatalities from falls of roof, rib and coal. Preliminary plans for this campaign were drawn at a meeting of representatives of the coal industry, the United Mine Workers of America and Federal and state governments.

Harry Gandy, Jr., director of Safety of the National Coal Association, was named general chairman and a committee representing all interested parties was drawn up. Roof, rib and coal falls, it was noted, are one of the chief causes of fatal coal mine accidents.

Administrative and planning work in this campaign will be carried on by personnel of the U. S. Bureau of Mines, under active direction of Harold Sloman, assistant to the Director of the Bureau.

Distinctive Anthracite

The Hudson Coal Co., Scranton, Pa., is spraying its Sterling Coal with aluminum paint to give it a high sparkle and brilliance for a "luxury" look. Aluminum powder is mixed with water-soluble resins, then sprayed over a hopper car of coal. Flowing down through the coal, the aluminum coating distinctively paints virtually each coal lump.

To Operate Coaldale Mine

Pierce Management, Inc., announces that James H. Pierce, chairman, John Marshall, president and F. L. Rousselle, executive vice-president and treasurer, have organized the Coaldale Mining Co., Inc., to operate the Coaldale mine. This mine produces 6000 tons of anthracite coal daily and employs 1500 men.

The officers of the new company are James H. Pierce, president, John Marshall, executive vice-president, F. L. Rouselle, vice-president and treasurer, and Thomas Welby, secretary and assistant treasurer.

AIME Awards

The Board of Directors of the American Institute of Mining and Metallurgical Engineers recently announced awards in recognition of achievement in the mineral industry field to 11 mining, metallurgical and petroleum engineers.

The list of awards included:

The *James Douglas Gold Medal* to **Edwin Letts Oliver,** president of Oliver United Filters Inc.

The *Erskine Ramsay Gold Medal* to **George Herman Deike,** chairman of the Board of Mine Safety Appliances Co.

The *Robert H. Richards Award* to **Edward Wilson Davis,** director-professor, Mines Experiment Station, Institute of Technology, University of Minnesota.

The *J. E. Johnson, Jr., Award* to Dr. **Gust Bitsianes,** assistant professor in the Department of Metallurgy, University of Minnesota.

The *Rossiter W. Raymond Award* to **Harold Vagtborg, Jr.,** petroleum engineer, Oil Department, National Bank of Commerce, San Antonio, Texas.

The *Mathewson Gold Medal* to **W. G. Pfann,** metallurgist on the technical staff of the Bell Telephone Laboratories.

The *Robert Peele Award* to **R. E. Thurmond,** mine superintendent, Pima Mining Co., and **W. E. Heinrichs, Jr.,** exploration engineer, United Geophysical Co.

The *Robert W. Hunt Award* to **F. W. Boulger,** supervisor of metallurgy and **R. H. Frazier,** both associated with Battelle Memorial Institute.

The *Daniel C. Jackling Award* to **E. D. Gardner,** formerly chief mining engineer, U. S. Bureau of Mines.

To Construct Mining Plant

Southwestern Engineering Co., Los Angeles, has been awarded a contract for the engineering and construction of a mining and metallurgical installation for the National Lead Co., S. A., of Argentina, it was announced by Robert P. Miller, Southwestern president.

Construction is scheduled to begin within the next two months. The project will include a lead, zinc and copper concentrator, power plant, pipe line and housing for personnel.

The installation will be located approximately 900 miles from Buenos Aires, near the Chilean border. Products produced will be transported to the smelter and manufacturing plant of National Lead at Buenos Aires.

Approximately two years will be required for the completion of the plant, according to present plans. The installation will substantially increase the availability of base metals for Argentine consumption. When in operation, it will provide employment for about 500 persons, and will make a significant contribution to the industrial economy of the region, it was pointed out.

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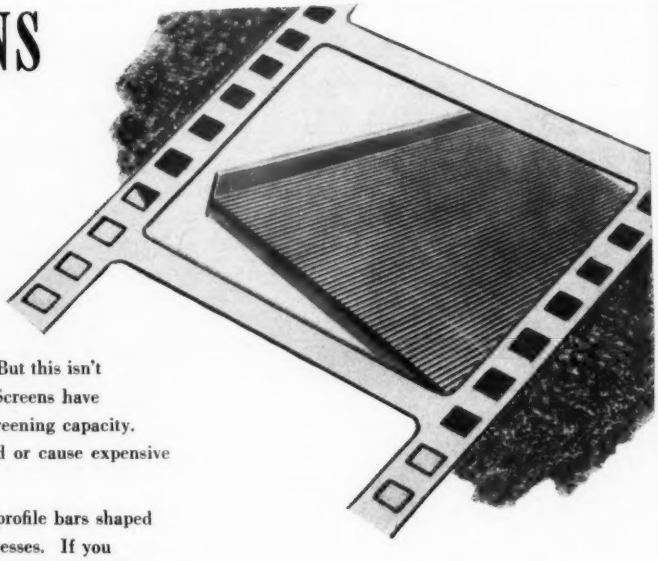

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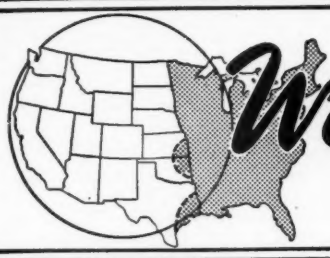

Western States

Montana Mining Men to Meet

Mining Association of Montana and its Helena Chapter, the Last Chance Gulch Mining Association, will hold their Eleventh Biennial Legislative Meeting in Helena on January 26, 1955. There will be an afternoon business session (and perhaps one in the morning). This will be followed by an all-Montana banquet, at which members of the Legislative Assembly will be guests of individuals representing all industries in Montana.

Expand Galena Mill

Expansion of the Vulcan-Galena mill on Lake Gulch west of Wallace, Idaho, to an approximate capacity of 350 tpd was completed in November.

Development work in the mine is proceeding at a satisfactory rate, and crosscutting toward the ore zones on the new 3,400 level, at 400 ft of additional depth, is now underway, according to a report recently released by Day Mines, Inc.

Reclamation Gets Research Funds

The Bureau of Reclamation has received a grant of $10,000 from the National Science Foundation for the support of research on "Hydration of Portland Pozzolan Cement" to be conducted in the Bureau's Denver Engineering Center, Secretary of the Interior Douglas McKay announced recently.

The research is designed to reveal new information on the fundamental chemical and physical reactions involved in the setting of cement in the presence of pozzolans. Pozzolans are materials widely used to supplement manufactured cement where large quantities are used. They get their name from the natural cement obtained near Pozzuoli, Italy, used since the time of the ancient Romans. That cement is a volcanic ash from Mount Vesuvius. Other natural cements are volcanic tuffs, pumice, and diatomaceous earth. Artificial pozzolans include fly ash, granulated blast furnace slag, and burnt clay or shale.

In addition to reducing the amount of manufactured cement needed in concrete construction, pozzolans are also effective in preventing the deterioration of concrete in the presence of alkalis. Although a considerable fund of experience has been accumulated in the practical uses of pozzolan-cement concrete, very little is actually known about the fundamental chemical and physical reactions involved.

The Bureau of Reclamation has the background of a 50-yr experience in concrete construction, including the construction of Grand Coulee, Hoover, Hungry Horse, Shasta and other dams. Fly ash was used in the construction of Hungry Horse dam, saving an estimated $6,000,000.

The Bureau already has specialized equipment at its Engineering Center, including X-ray diffraction and differential thermal analysis equipment, which will greatly facilitate the immediate initiation of this research.

Announce Scholarship

A. J. O'Connor, vice-president and general manager of Consolidated Coppermines Corp., has announced that a "Consolidated Coppermines Foundation Scholarship," in the amount of $500 annually, will be awarded to a student graduating from the White Pine County High School, White Pine County, Nev., who has had a good scholastic record and shows qualities of leadership. Financial need will also be considered in making the award. The recipient may enroll in a course of his own choosing and at a school of his own choosing. Nick Reyes was the first recipient of this scholarship and is now enrolled at the University of Nevada, in the School of Engineering.

Ship Silver City Uranium Ore

Officials of the Atriminas Uranium Production Corp., have reported they have received permission from the AEC to begin shipping ore stockpiles to refineries. Company officials said the ore shipments to refineries would probably start this week. The ore is being mined from claims in the White Signal district, 18 miles south of Silver City, N. M.

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Telluride Reopens Mines

The Telluride, Colorado mines will be opened on a scale that will employ 200 to 250 miners early next year according to Oscar H. Johnson, chairman of the board of the Idarado Mining Co. The company, which owns the Idarado mine in the Telluride district, is a subsidiary of the Newmont Mining Co. The firm is first planning a new concentrator to hike the ore-capacity from 800 to 1400 tpd.

Water for Manganese Mining

Sufficient water can be developed for production and treatment of low-grade manganese ores in the vicinity of Artillery Peak and Alamo, Ariz., according to a Geological Survey report released recently by Secretary of the Interior Douglas McKay.

The Bill Williams River is the source of practically all the water in the area, and during much of the year the surface flow in this stream would be sufficient to supply all the contemplated needs of a mine, mill, and camp. However, there are periods in almost every year when the streamflow is seriously diminished and when the water-supply requirements would need to be met by ground water.

All studies indicate that ground-water storage in the basin near Alamo is less than might be expected from the surface appearance of the valley. However, it is estimated that recoverable storage amounts should be enough to satisfy the estimated average annual deficit in available surface water of less than 1000 acre-ft.

In addition to the study of conditions in the immediate vicinity of Alamo, water samples were taken and streamflow measurements were made at intervals in the reach of the Bill Williams River between Alamo and Planet, about 30 miles downstream. An area in the vicinity of Planet is suggested as a possible supplemental ground-water reservoir that might be utilized if needed.

The report is based upon data collected by the Geological Survey during the spring and summer of 1951. Entitled "Water resources of the Bill Williams River valley near Artillery Peak and Alamo, Ariz.," the report was prepared by H. N. Wolcott, H. E. Skibitzke, and L. C. Halpenny. Pending publication as a water-supply paper, typewritten copies are available for inspection at the following Geological Survey offices: Room 1242-G, General Services Administration Building, 18th and F Streets, N. W., Washington, D. C.; 136 N. Park Avenue, Tucson, Ariz.; and 133 W. Monroe Street, Phoenix, Ariz.

Hidden Splendor Uranium Mine

The new uranium mining subsidiary of the Atlas Corp. will be called the Hidden Splendor Mining Co., it has been announced by Floyd B. Odlum, president of the Atlas Corp. Odlum will serve as chairman of the board of the new company which will operate the Delta mine in southern Emery county about 30 mi. from Hanksville, Utah, recently purchased from Vernon Pick. Pick will be president of the new company.

The Delta mine has been producing between 30 and 40 tpd of ore from development and exploratory operations which have involved only a small part of the mining claim area. Known ore bodies are estimated to exceed 300,000 tons of ore. Present plans are to mechanize operations to raise production to not less than 200 tpd.

Idaho Builds Staff

For the first time in several years the Idaho Bureau of Mines and Geology will have a full complement of authorized staff members, according to a recent announcement by Dr. James Donald Forrester, director of the bureau and dean of the college of mines at the University of Idaho.

Promoted to assistant director of the bureau in addition to his duties as

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bureau metallurgist was Lewis S. Prater. A graduate of the Montana School of Mines, Prater has been on the staff since 1941.

Harold A. Powers was named bureau geologist. For the last few years, he has been employed by the National Lead Co. in the Central and Western states. He is the author of the Idaho Bureau of Mines bulletin on "Diatomite Deposits in Southwestern Idaho," published in 1947.

Appointed chemist-analyst for the bureau was Charles R. Kurtak. A chemist for the bureau for a number of years, Kurtak will now take over somewhat expanded duties.

Forrester said that an additional appointment for a mining engineer in the bureau is pending, and that announcement of the filling of this vacancy would be made shortly after January 1.

"The staff additions will provide full-time engineers and scientists working in the professional areas of geology, mining and metallurgy, supported by the chemical and mineral identification service," Forrester added. "Research fellows and part-time summer employes will also be utilized to augment the bureau program of increased service to the state in mineral-resource development."

New Montana Gold Strike

A new and virgin body of gold and silver ore has been discovered in the old August mine, also known as the Little Ben, near Landusky, Mont., according to Frank B. Bryant, a director of the Little Rocky Mining Development Co.

Solvent Sulphur Plant

The American Sulphur Refining Co., with headquarters in Beverly Hills, Calif., is constructing a plant using an entirely new process for the recovery of sulphur. William Neale, sales manager for the company operating in Beaver county, Utah, said that his company has purchased 20 acres of the main deposit of ore at Sulphurdale in Beaver county and has an option on an additional 7000 acres next year.

The new refinery, the first of its kind in this country, will use a solvent recovery method which is old in the refining of other metals, but new in the sulphur industry. Representing a half million dollar investment, the new plant will be completed in December and will be in operation by January.

Production will be 100 tons of refined crystalline sulphur a day. If sales justify, the plant will be increased in size until its output becomes many times that figure, according to Neale. The sulphur deposit has been worked for 75 years and is located north of Beaver about 20 miles and south of Old Cove Fort approximately five miles.

Drive Raise Into Ore

New Rainbow Mining Co. is stockpiling silver-gold-lead-zinc ore from a new two-compartment development raise in the old Weber mine near Lakeview, Idaho.

The raise is going up in an ore zone exposed last spring in reopened workings. About 175 tons of the ore have been stockpiled.

A tunnel is being driven around caved workings east of the main adit to explore for the downward extension of an orebody being mined downward from the surface.

A west drift from the main adit has made connection with old workings, which supposedly contain a vein of silver-lead ore. Caved ground must be cleared before the vein can be examined.

Ray Underground to Close

Kennecott's underground mine at Ray, Ariz., which began operation before Arizona was a State, will be shut down in January. More than 64,000,000 tons of copper ore have been removed in the past 43 years from the historic old No. 2 mine of the Ray Mines Division of the Kennecott Copper Corp. According to A. P. Morris, division general manager, the ore below the present workings does not contain enough copper to warrant expense of going deeper.

The division will maintain its copper production entirely from open pit workings which began producing in October 1951, after the removal of more than 47,000,000 tons of overburden. Stripping operations required three years. Ray Mines Division produced 94,500,000 lb of copper last year.

With abandonment of the underground mine, about 80 workers will be displaced but the company has promised to do all possible to see that they are re-established in some other job.

Honor Copper Company Employes

On November 5, Chester D. Tripp, president of Consolidated Coppermines Corp., presented attractive wrist watches to seven employes of the company who had completed 25, or more, years of service. The presentation was made at a dinner in the Nevada Hotel in Ely, Nev. Employes receiving watches were: John Eaby, chief clerk; A. J. Proctor, churn drill foreman; F. J. Tong, churn driller and welder; V. D. Hall, accountant; A. J. O'Connor, vice-president and general manager; Thomas Gilmour, master mechanic; and Miner W. Shields, chief electrician. Eaby has the longest service record—37 years.

Consolidated Coppermines operates copper properties in White Pine County, Nev., and is one of the important copper producers of the State.

WANTED

ASSISTANT ENGINEER—Long established coal mining company in Utah has an opening for young Graduate Mining Engineer. Applicant must be qualified to do mine surveying, mapping, etc. Salary open. Send references, photo, outline of experience and salary expected to: Box 176, Mining Congress Journal.

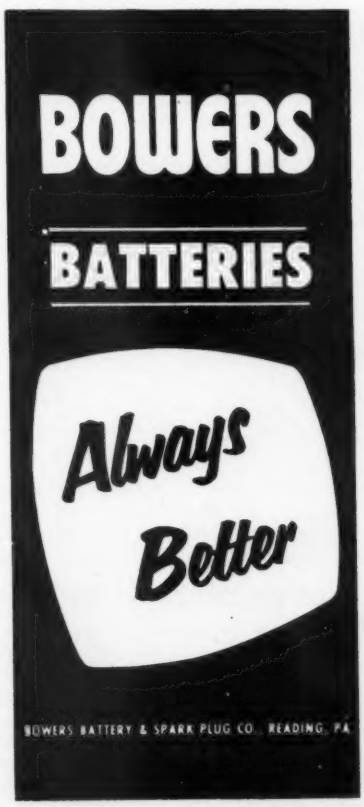
Developing Rock Quarry

A new limerock quarry is being developed in Chelan County, Wash., by the Northwestern Portland Cement Co. The quarry is about 10 miles above the head of Lake Wenatchee.

Concrete foundations ware placed last fall for the large crushers. Preliminary clearing of a portion of the quarry site has been completed and concrete foundations for a conveyor system will be poured next spring.

Equipment to be installed includes a primary crusher, an impactor for secondary crushing, several conveyor systems, a stockpile, and bunkers for truck loading. The crushed limestone will be trucked to a loading site on the Great Northern Railway for transport to Northwestern's cement plant at Grotto, Wash.

Capacity of the new plant will be 1000 tpd of rock.



Vitro Mining Uranium

Vitro Corp. of America entered the atomic energy field in 1942 through chemistry, raw materials and the engineering of the original gaseous diffusion plants at Oak Ridge, Tenn., and has now entered the field of uranium mining. This was announced early last month by William B. Hall, general manager of Vitro Uranium Co., a division of the corporation which operates a uranium ore processing mill.

Vitro has acquired an interest in 57 uranium claims from the Sateco Mining Co. in the Gas Hills area of Fremont County, Wyo. Exploration and drilling in preparation for the mining of ore has been begun on these claims.

The company's other uranium ore interests are near the San Rafael Swell district of east-central Utah, including the Daye-Davis and Desert Queen claims and a nearby Utah school section. In addition, the company shares in extensive claims in the Blind River district of Ontario, Can. Vitro Uranium's ore and mining department is under the direction of Jack O. Horton of Salt Lake City.

Increase Rico Operations

Operation of the Minerals Mining and Milling Co., mill at Rico, Colo., is now on a two-shift basis, and it is planned to add a third shift very soon. A lead-silver concentrate is being milled. At full capacity the plant will handle 100 tpd. The ore is coming from property leased by Minerals Mining and Milling from Union Carbide and Carbon Co., Ken Erickson is manager and mill superintendent and Eddie Baer is superintendent in charge of the mine.

Alaskan Fire Costly

The Department of Mines, Territory of Alaska, reports that a fire at the Red Devil Mine of the DeCoursey Mountain Mining Co. on October 22 caused damage estimated at $300,000. Starting in the hoist house, the fire spread quickly to the power house, blacksmith shop, mine buildings and reduction plant. The bunkhouse, mine office and storehouse were saved. The company plans to continue underground exploration, but it is estimated that production from the mine will be delayed about a year.

Utah Iron Industry 102 Years Old

Brigham Young heard about deposits of iron ore in southwestern Utah soon after he and his followers arrived in Salt Lake Valley in 1847. Within five years a group of pioneers had been sent to the Cedar City area by Young and had produced the first pig iron made west of the Missouri River. Indians and cloudbursts virtually eliminated the pioneer attempt in 1853. Another try was made and on one day in 1855, the primitive furnace produced 1700 lb of "good pig iron," which was cast as stoves and other utensils.

The original furnace was closed in 1858 due to financial and supply troubles. Fifteen years later, the mines were reopened and a blast furnace rated at 2400 lb of iron a day was put into production. This venture lasted ten years.

In the period preceding 1940 iron ore production came principally from the mines of the Columbia Steel Co. World War II brought a major increase in Utah's iron mining. Heavy industry was vital in the West and the Government financed construction of the $250,000,000 Geneva plant near Provo.

In 1953 about 5,500,000 tons of iron ore were shipped from the area west of Cedar City.

Awarded DMEA Contract

Scratch - All mine, Philipsburg, Mont., operated by Peter Antonioli, has been granted a government contract to explore for manganese, lead and zinc. DMEA's share of this project is $80,200; the total amount of the project is $128,320.

Ruby Silver Mill Installed

Ruby Silver Mines, Inc., has installed a 50 to 70-ton flotation mill at the old Garrett mine one and a half miles east of Nespelem, Wash.

Current plans call for continuing exploration and development work throughout the winter and stockpiling of ore for resumption of milling operations next spring.

Sink Idaho Slope

Exploration and development of the Hailey Trust's uranium prospect west of Hailey, Idaho, is being pushed with all possible speed to get as much work done as possible before winter weather handicaps operations.

A 120-ft inclined shaft in the footwall of the uranium-bearing vein structure has been completed and consideration is being given to extending it an additional 20 ft before crosscutting to the vein.

The shaft, driven on a 45-degree slope, is about on the line between the unpatented Treasure Bell claim and the patented Donovan property. It was started about two months ago after efforts to reclaim an abandoned old shaft 75 ft to the Northwest were unsuccessful.

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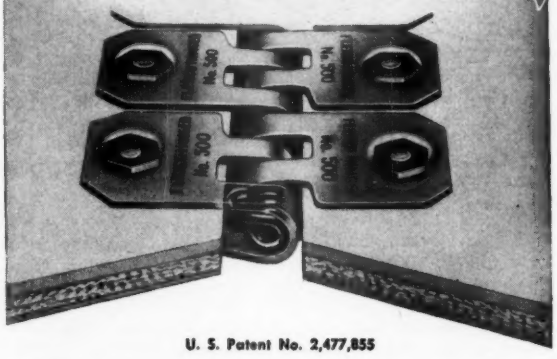

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Buy California Uranium Claims

Great Lakes Oil and Chemical Co., has acquired 50 uranium claims in the vicinity of Kernville, Kern County, Calif. and will begin mining operations immediately. Charles S. Hale, president of the company said scintillator tests on the claims, followed by preliminary assays of ore samples, have indicated the presence of commercial ore.

Vindicator Shaft-Work

Shaft-sinking at the Vindicator Silver-Lead Co. property east of Mullan, Idaho, has reached the 750-ft depth objective and a station is now being cut at that horizon, according to Superintendent Gale Hansen.

As soon as the station is completed, the shaft will be deepened an additional 50 ft to provide sump and pocket facilities for a lateral exploration program. Crosscutting toward the projected downward extension of the Vindicator mineralized shear zone was scheduled to get under way by the end of November. The shear zone is estimated to lie between 200 and 300 ft. north of the shaft.

The shaft and deep-level exploration project is being carried out under a DMEA contract negotiated by the Silver Buckle Mining Co., which is the operating company under a profit-sharing development agreement with the Vindicator Silver-Lead Mining Co., owner of the claims.

Lucky D Blocks Out Ore

The Lucky D Uranium Mining Co., of Cortez, Colo., reports it has blocked out some 50,000 tons of ore on its Sandy and Yellow John claims at Frey Point in the White Canyon mining district in San Juan county, Utah. The completion of an extensive drilling program on the property has revealed an extensive orebody on two claims. Overburden on the orebody runs to about 15 ft, which is expected to result in low mining costs according to Wade A. Dillon, president of the firm.

Lease Tungsten Mill

Minerals Engineering Co., Grand Junction, Colo., has announced the completion of negotiations to lease the Baltimore-Camas tungsten mill at Ely, Nev. The property is controlled by Idaho interests, J. W. Williams, Boise, Idaho, is president of Baltimore-Camas. Blair Burwell is president of Minerals Engineering Co.

At the same time the company announced that arrangements had been completed between Minerals Engineering and Murphey Brothers of Ely and Goldfield, Nev. for the operation of the Monte Cristo tungsten mine near Ely. Located on the west side of White Mountain, 60 miles from Ely, the mill will be reequipped so that production of 100 tpd of tungsten oxide will be achieved.

Burwell also announced that Minerals Engineering has posted a new ore-buying schedule at Ely and that the Baltimore-Camas concentrator will operate as a custom mill. Purchase price, delivered, for 1 percent tungsten ore is $30 a ton. The mill will buy as low as .40 percent WO_3. It is anticipated that 90 percent recoveries will be made at the mill. Concentrates from the 150-ton-a-day mill will move by truck to the Salt Lake Tungsten Refinery Co., at Salt Lake City.

Minerals Engineering earlier this year placed a tungsten mill in operation at Glen, Mont. Concentrates are now being refined from that mill by Salt Lake Tungsten Co. It is hoped that the Baltimore-Camas plant will provide an expanded market for the very substantial amounts of low-grade tungsten ores existing in Nevada.

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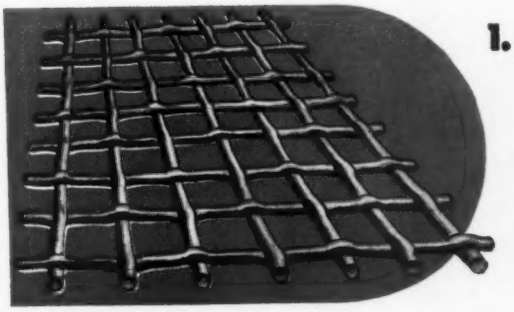

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Joint Potash Development

The National Farmers Union and Kerr-McGee Oil Industries, Inc., have agreed on joint development of the Union's potash reserves in the Carlsbad, N. M. area, officials of the Union have reported. Kerr-McGee will sink a shaft near Artesia, N. M., and pilot plant operations for evaluation of the reserves will be carried out, probably by the Colorado School of Mines. Some $750,000 has already been spent by the Union on core drilling operations and Kerr-McGee will spend that much on development. Ultimately a new corporation will be formed to mine, process and distribute the potash. It will be owned equally by the Union and Kerr-McGee. The School of Mines survey indicates the net value of the deposits, underlying a 13,000-acre holding, may run as high as $100,000,000.

New Montana Tungsten Mine

Bon Terre Corp. has started mining tungsten ore in Granite County, Mont., according to R. R. Gibson, president and general manager. Following about five months exploration work, two new tungsten deposits have been opened up and plans call for milling the 50 tpd production at Hall, Mont. The company also announced discovery of a vein of copper ore in mining claims six miles northwest of Northport, Wash.

A 30-ft crosscut into the wall of an old tunnel picked up the vein which had been missed by early-day prospectors. Additional work is planned for next season.

Contact Sprouts

Utah Mining Association as a part of its "grass roots" public relations campaign in behalf of the mining industry has recently completed the distribution of more than 1100 boxes containing specimens of ore minerals found in Utah to sixth grade teachers in elementary schools and to science teachers in secondary schools throughout the State.

The project, according to Miles P. Romney, manager of the Association. is designed to bring home to the school children of the State the importance of the mineral industry to themselves and to their neighbors. Each box contains 24 specimens, a map showing the source of each and brief discussion of the history, economics and enduse of the valuable mineral in each specimen.

Utah State Superintendent of Public Instruction, Dr. E. Allen Bateman and Dr. Lynn Bennion, Superintendent of Salt Lake City's schools, have both heartily endorsed the project and consider it "a great aid to teachers in giving instruction in the resources and economics of the State."

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Manufacturers Forum

½-Yd Shovel Introduced

Introduction of a new ½-yd machine with "big rig features" has been announced by the Link-Belt Speeder Corp., Cedar Rapids, Iowa.

The new machine is the LS-58 and is one of a series that has been forth-

coming from Link-Belt Speeder Corp. which has been introducing new machines in a number of popular classes.

As in other new Link-Belt Speeder machines, basic key to the greater productive capacity of the LS-58 is its power hydraulic "Speed-o-Matic" controls which are designed to bring about smooth, instantaneous response with easy fingertip control.

Dust Collector

A new mechanical dust collector called the Paraclone has been developed by the Aerodyne Corp., 1520 Lakeside Ave., Cleveland, Ohio. The

new unit includes a secondary circuit which keeps the discharge from the small cyclones in the primary units under constant negative pressure. This prevents recycling of the dust in the primary system according to the company. The Paraclone system is said to be adaptable to high and low-temperature gases containing small and large abrasives or non-abrasives. It is said to be particularly efficient for dust particles in the 0 to 15-micron range.

Control Cable

New flexible control cables with from 5 to 24 conductors are now being manufactured in sizes 18 through 10 A.W.G. by Western Insulated Wire Co., 2425 East 30th St., Los Angeles 58, Calif.

Conductors in the new Bronco 60 Certified Control Cable are made of pure, annealed electrolytic copper for maximum flexibility and flex-life. Insulation over the conductors is heat-resistant type RH Rubber. Singles are coded with permanent colors.

Make It Watertight

Dasco Chemical Co., Inc., 1602-04 Thames St., Baltimore 31, Md., has on the market a waterproofing agent for use below grade and in tunnels and pits. Called Dastite, the material's primary use is in waterproofing or damp-proofing concrete walls which, through defective construction or by expansion and contraction, show open cracks or porous places where water or dampness can seep or run in. Write the manufacturer for additional information.

Hand Type Wire Stripper

A new hand type wire stripper for general work and production jobs is being announced by Crown Industrial Products Co., 1112 Amsterdam Street, Woodstock, Ill.

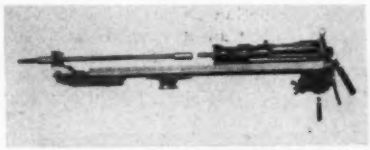
Fabricated of hardened steel construction throughout, the stripper has interchangeable, precision-milled stripping blades carefully matched to strip insulation clean without damaging the wire. It strips both stranded and solid wire.

Durable, but light in weight, the stripper is available in three models. Replacement blades are also available. Changing of the blades can be done in a matter of seconds by removal of two screws.

Deep Hole Drill

A new deep hole percussion drill with a hammer diameter of 4½ in. has been announced by Gardner-Denver Co. of Quincy, Ill. Designated Model SFH123, the new 4½-in. drill is said to be a big brother to the four-in. Gardner-Denver SFH99 Drill which has been extensively used for deep hole drilling in underground mines.

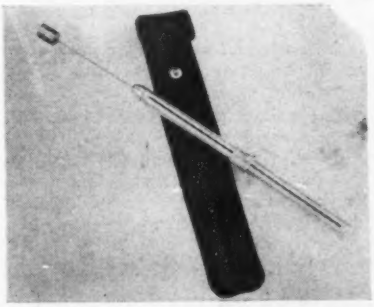
Like the SFH99, the new 4½-in.



drill has been engineered for use with the Gardner-Denver Ring Seal Shank and Section Drill Rods. It is mounted on a compact screw feed guide shell which handles steel changes up to eight ft. The SFH123 provides increased drilling speed and power for handling longer holes on any deep hole drilling project, or for drilling long holes of larger diameter.

Measure Slow Speeds

A new, low speed model has been added to the Vibra-Tak line of tachometers and vibration indicators for



finding the speed of oscillation on vibrating screens, conveyors, separators, crushers, grizzlies, tampers, vibrators, large engines and other industrial equipment. It has a range from 200 to 2000 cycles per minute.

For complete information write Martin Engineering Co., Neponset, Ill.

Hoist Offered

A light and versatile hoist is being manufactured by Griphoist, Inc., 700 Polk Street, San Francisco 9, Calif. The Tirfor Griphoist weighs 42 lb and has a nominal capacity of 3300 lb on a single line. With the use of

multiplying sheaves, loads of 6 to 10 tons can be handled. At full load, speeds of 10 fpm, cable travel can be obtained. The load can also be controlled in either direction to thousands of an inch, according to the maker, a very important feature when the hoist is used for machinery erection.

Speed-Reduction Units

The American Pulley Co. announces a complete new line of Shaft-King Speed-Reduction Drives now available for mounting in a vertical position. These speed reducers are shaft-mounted units designed for applications where the driven machine shaft

is in a vertical position or nearly so, as on mixers, agitators and liquid processing machines.

The units can also be supplied with an overload release which, it is claimed, gives complete protection to the driven machine, motor and drive, for operations where jam, choke or shock loads may occur.

Replaceable Blade Insert Bit

A new insert rock bit designed to improve the efficiency of rotary drilling in minerals exploration has been developed by Herb J. Hawthorne, Inc., Houston, Tex.

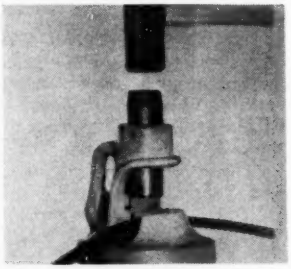
The Hawthorne Insert Rock Bit is made of tough tool steel and utilizes a special quality of tungsten carbide inserts on the cutting surfaces of the bit. An improved watercourse in the bit for flushing out cuttings is said to assure faster penetration and a cleaner hole.

Like all Hawthorne Bits, these Insert Bits were developed on Hawthorne's patented interchangeable, replaceable blade design, permitting the use of many sets of blades with the same bit body.

Hawthorne Insert Rock Bits are available in 4¼, 4½ and 4¾-in. Type "AC" blade sizes, and 3½, 3⅞, 4 and 4¼-in. Type "DB" blade sizes with the adapter sub into which the bit shank screws available with box or pin connection to fit any available drill rod or drill collar.

Wire Cutter

The Montgomery Mfg. Co., 24 Austin Street, Newark 5, N. J., announces that a full line of Hammerblow brand



wire rope cutters is now in production. The company claims that three or four raps with the proper size sledge and the cutter will cut any size wire rope up to 1½-in. diam. The cutter is completely portable and simple and rugged in construction.

Add to Wheel Scraper Line

Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis., has added a 15-cu yd struck, 19-cu yd heaped, capacity rubber-tired four-wheel scraper to its line of pull-type scrapers. The new unit is cable-controlled and features positive forced ejection. It provides a 9 ft 8-in. wide cut with its carbon steel heat-treated offset type cutting edge. Rear bowl ground clearance is 20½ in. and front axle clearance 29 in. when 21.00x24 tires (standard for the 315) are used. Approximate shipping weight with the 21.00x24 tires is 25,850 lbs.

Minimize Weld Corrosion

The Electric Steel Foundry Co. of Portland, Ore., is now accepting orders for 0.03 maximum carbon stainless steel castings. The company reports it is now able, as a result of research, to guarantee a maximum carbon content of 0.03, or lower, under special conditions.

A brochure giving the complete story of this development is available on inquiry to the company at 2141 N. W. 25th Ave., Portland 10, Ore.

Pump That Sump

A large capacity pneumatic sump pump has been announced by Schramm, Inc., West Chester, Pa. The company reports that the sump pump can be dropped in the water, eliminating priming, and can be operated by any 105 or 125-cfm compressor. The maker also reports the pump will handle mud and has been designed with an exceptionally large capacity.

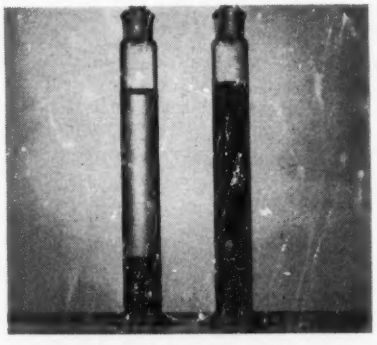
Hose for Solids Transportation

B. F. Goodrich, Akron, Ohio, announces a new rubber hose for hydraulic transportation of solids. Designed primarily in the use of the mining industry, the hose is lined with a special rubber compound called Armorite. It is available in sizes of one to 14-in. diam and in construction for working pressures from 50 to 250 lb. An interior spiral wire reinforces the hose to prevent kinking, crushing and collapsing.

New Flocculating Agent

A new coagulant or flocculating agent has been announced by the Dow Chemical Co. under the trade name of Separan* 2610.

This new material is reported to be effective in dosages as small as one part per two million parts of dispersed solids. Its capacity for tying particles of material together is so great that



compared to other types of flocculating materials the amount used may be reduced as much as 30 times, according to the announcement.

A variety of successful applications has been made, and the product is available for commercial use. Samples, technical assistance and directions for use may be requested from Technical Service and Development, the Dow Chemical Co., Midland, Mich.

* Trademark.

Add New Scraper

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has added a medium-sized, rubber-tired, pull scraper, its Model 108, with an 8.4 cu yd struck and 11-cu yd heaped capacity.

Cable operated, Model 108 is of welded box-type construction with an over-all length of 27⅓ ft, over-all width of 10⅓ ft, and in load-carrying position, a 7⅝-ft height. Width of the cut is 8½ ft, and depth may be up to 10 in.

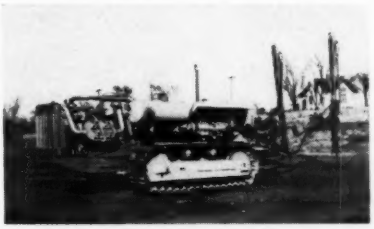
Features of the new unit include its three-piece reversible type cutting edge, heat treated and hard faced; free floating type front apron, for loading all types of material; a low and wide bowl with curved bottom and smooth interior, and for spreading, positive forced ejection.

Tractor Jumbo

Here's a drilling rig that is providing contractors as well as mine and quarry operators with a completely self-contained mobile unit. The complete outfit consists of Gardner-Denver rock drills on long feed mountings, Gardner-Denver hydraulic booms, and a complete Gardner-Denver air compressor for powering the drills, all mounted on a Caterpillar D-8 Tractor.

Garner-Denver compressor assemblies are available in capacities of 600 cfm, 500 cfm, 365 cfm and 315 cfm for direct connection to the rear power take-off of D-8 Tractors.

Hydraulic booms are available in various lengths. A choice of several drill sizes and several types of feed mountings provides the opportunity



to have a tractor-mounted jumbo unit tailored to individual job requirements.

Remote controls, which permit all drilling and positioning operations to be controlled from a central station on the tractor for one-man operation, are also available.

Mounting and operating specifications may be obtained from Gardner-Denver Co. in Quincy, Ill.

— *Announcements* —

William F. Haddon has been appointed manager of advertising and sales promotion for **Western Machinery Co.** Haddon has been manager of advertising for General Metals Corp. for the past three years. Prior to his connection with General Metals, Haddon was manager of advertising for Denver Equipment Co. He with this firm for seven years and began his connection as editor of the *Deco Trefoil*, technical magazine published by the company.

Arthur W. Fasold has been named assistant to the general sales manager of the conveyor and rubber divisions, **Hewitt-Robins Incorporated**, Stamford, Conn.

C. B. Peck, Jr., has been appointed manager of Industrial Sales, **Anaconda Wire & Cable Co.** He formerly was manager of sales of Rubber & Plastic Insulated Products for the company.

The appointment of **G. V. Woody** as special assistant to **C. W. Schweers**, vice-president, director of sales, general machinery division, **Allis-Chalmers Mfg. Co.**, has been announced by **J. L. Singleton**, vice-president in charge of the division.

Singleton also announced that **William M. Wallace** would succeed Woody as manager of the firm's processing machinery department.

Edward H. D. Gibbs, sales manager of **Heyl and Patterson, Inc.**, Pittsburgh, Pa., has announced the appointment of **A. G. Gilbert** as manager, Standard Products Sales.

In his new position, Gilbert will have charge of the sales of the standard products sold by Heyl & Patterson to the coal, utility, mining, steel and chemical industries. He has served on several committees of the Coal Division of the American Mining Congress and has written and delivered several papers before association meetings.

Hendrick Mfg. Co. has announced that **E. Donald Schreckengost** has been appointed a Hendrick sales engineer. Schreckengost comes to Hendrick from the Freebrook Corp. in Kittanning, Pa., where he had been preparation manager for the past eight years.

CATALOGS AND BULLETINS

CABLE REEL SHUTTLE CARS. *Goodman Mfg. Co., Halsted St. & 48th Pl., Chicago 9, Ill.* Bulletin No. 5411 describes two shuttle cars, one for low coal and one for intermediate height coal. Dimensions and construction details of both cars are included with a description of their operation.

CANTON MINING EQUIPMENT. *The American Mine Door Co., Canton 6, Ohio.* This booklet outlines the application of the company equipment in the mining industry.

CYCLONES. *Heyl & Patterson, Inc., 55 Fort Pitt Blvd., Pittsburgh 22, Pa.* This 20-page booklet describes the Heyl & Patterson Cyclone for thickening, classification, clarification or recovery of suspended solids. Typical applications in the coal, metallic and nonmetallic mining industries are included.

ENGINE-GENERATOR SETS. *Le Roi Division, Westinghouse Air Brake Co., 1706 S. 68th Street, Milwaukee 14, Wis.* This new bulletin on Le Roi "Custom-Built Engine-Generator Sets" describes and illustrates seven engine models from 60 to 700 hp with generators capable of producing from 50 to 350 kw.

IMPROVED CYCLONE DESIGNS. *Equipment Engineers, Inc., 41 Sutter St., San Francisco 4, Calif.* A twelve-page catalog illustrating four basic model cyclones and describing new features of moulded pure gum replaceable lining and integral two-stage cylindrical design. Contains informative data on role of cyclones in classification and presents full details of specific applications of each model with varied objectives. Bulletin No. 121. Equipment Engineers, Inc., 41 Sutter St., San Francisco 4, Calif.

INDUSTRIAL PRODUCTS CATALOG. *American Brake Shoe Co., 230 Park Ave., New York 17, N. Y.* This 48-page book illustrates products of 11 divisions of the company and details physical properties or characteristics where pertinent. The catalog contains sections by type of product on ferrous and nonferrous castings, bearing materials, sintered metals, steel forgings, welding products, air compressors, industrial pumps, dredge pumps, and railroad products.

LINK-BELT PRODUCTS. *Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.* Catalog 950 is a 340-page standard products catalog of the Link-Belt Co. Products shown fall into several major classifications including chain and sprockets for conveying, elevating and power transmission. Stock products are readily identified and the catalog is thumb-indexed for ease of use.

MODERN MINING METHODS. *Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis.* This 16-page booklet gives a pictorial review of the Allis-Chalmers line of industrial equipment as applied by the mining industry.

NEW PRICE LIST. *The Hoffman Bros. Drilling Co., Punxsutawney, Pa.*, announces a new Price List with prices to be effective November 1, 1954. The new list contains specifications, ordering information and prices on Hoffman Bros. complete line of Oriented Diamond Core Drill Bits and Supplies. Sent free upon request.

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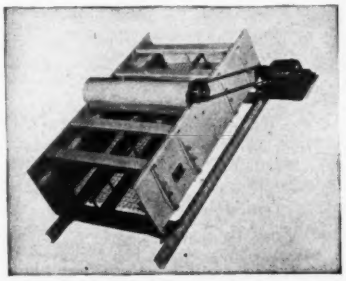

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